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**Investment Promotion Sectoral Strategy 2005-2007:  
Precision Engineering Sector**

Final Report

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## ABSTRACT

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This report examines Jordan's industry for precision engineering and the production of tools, dies and molds, in order to formulate a three-year strategy and other concrete steps the Jordan Investment Board can implement to promote foreign direct investment and domestic direct investment into this sector.

## ABBREVIATIONS AND ACRONYMS

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<b>AFTA</b>	Arab Free Trade Agreement
<b>AMIR</b>	Achievement of Market-friendly Initiatives and Results Program
<b>AMBA</b>	American Mold Builders Association
<b>CAD</b>	Computer aided design
<b>CAM</b>	Computer aided manufacturing
<b>CNC</b>	Computer numerical control
<b>CTMA</b>	Canadian Tooling and Machining Association
<b>DOS</b>	Department of Statistics
<b>EU</b>	European Union
<b>FDI</b>	Foreign Direct Investment
<b>GSP</b>	General System of Preferences
<b>HS</b>	Harmonized System
<b>HTS</b>	Harmonized Tariff System
<b>HKMDC</b>	Hong Kong Mould and Die Council
<b>ISTMA</b>	International Special Tooling and Machining Association
<b>JD</b>	Jordanian Dinars
<b>JIB</b>	Jordan Investment Board
<b>JUSFTA</b>	Jordan-United States Free Trade Agreement
<b>MENA</b>	Middle East & North Africa (Region)
<b>NAFTA</b>	North American Free Trade Agreement
<b>NTMA</b>	National Tooling and Machining Association
<b>NTR</b>	Normal Trade Relations
<b>OEM</b>	Original Equipment Manufacturer
<b>PSPI</b>	Private Sector Policy Initiative
<b>QIZ</b>	Qualifying Industrial Zone
<b>SWOT</b>	Strengths Weaknesses Opportunities and Threats
<b>TDM</b>	Tool, die and industrial mold
<b>TMA</b>	Tooling and Machining Association
<b>USAID</b>	United States Agency for International Development
<b>WTO</b>	World Trade Organization

## DEFINITIONS

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<b>Die</b>	Device for cutting out, forming or stamping material
<b>Fixture</b>	Device for holding a work piece or assembly during manufacturing operations
<b>Jig</b>	Device for holding a work piece while guiding or controlling a cutting tool
<b>Lead time</b>	Time between receiving an order and completing it for delivery
<b>Mold</b>	Hollow form within which, or solid form around which, molten material is shaped
<b>Tool</b>	In TDM industry usage, a die, punch tool for a die, industrial mold, jig or fixture
<b>Tooling</b>	Tools, dies and industrial molds

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## EXECUTIVE SUMMARY

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Jordan's precision-engineering sector, especially its tools, dies, and molds (TDM) subsector on which this study focuses, enjoy certain competitive strengths within the region and the world that make this industry potentially attractive to foreign investors.

The objective of this consultancy is to work with the Jordan Investment Board (JIB) to evaluate Jordan's competitive position in the precision engineering industry, in light of global trends that influence the industry, and to develop an appropriate three-year strategy to promote inward investment.

Investors in the precision engineering industry consider the following factors among others when deciding on the location of a production plant. (See Section 4.2 for further details.)

- Sizeable home manufacturing base
- Access to expanding local and regional manufacturing market
- Availability of expertise in design, machine operations, and process optimization
- Culture of accuracy and precision
- Ability to satisfy quick lead and delivery times
- Ability to provide after-sale service and support

A strengths, weaknesses, opportunities and threats (SWOT) analysis of Jordan's TDM industry reveals the following. (See Section 4.3 for further details.)

- Main strengths
  - Available, well-educated, bilingual (Arabic and English) workforce
  - Low overall labor costs relative to regional competitors
  - Fast delivery times and low shipping costs relative to Asian competitors
  - Proximity and access to regional and European markets
  - Good craftsmanship and reputation for quality relative to regional competitors
  - Good infrastructure (especially communications) relative to regional competitors
- Main weaknesses
  - Large number of small, fragmented TDM manufacturing workshops with little cooperation
  - Small domestic manufacturing base in Jordan and insufficient demand
  - Price-sensitive local market and price-based competition
  - Insufficient number of industrial designers
- Main opportunities
  - Growing global trend towards outsourcing to lower cost producers
  - Local and regional markets are growing, especially Saudi Arabia where demand for TDM in manufacturing sector currently outstrips supply
- Main threats
  - Continuing competition from inexpensive, second-hand TDM from Taiwan
  - Increasing competition from inexpensive TDM from China and India

Based on the results of the SWOT analysis, Jordan has the best opportunities to compete within the following niche areas of the TDM subsector. (See Section 5.1 for further details.)

- Dies for drawing of extruding metal, of base metal
- Molding patterns
- Molds for metal or metal carbides (other than injection)
- Molds for mineral materials
- Molds for rubber or plastic manufacture of semi-conductors

Furthermore, Jordan may expect future investments to come from the following sources. (See Section 5.2 for further details.)

- Local investors wishing to establish export-oriented TDM companies to take advantage of Jordan's skilled labor force and central location
- Financial investors from Saudi Arabia who would contribute capital and leverage local expertise to serve the expanding Saudi manufacturing sector, in which demand outstrips local supply
- European companies wishing to outsource TDM manufacturing or assembly operations to low-cost producers, especially German ones, where there is a high concentration of TDM manufacturers that suffer from prohibitive labor costs

Consequently, target markets and investors for investment promotion are as follows. (See Sections 6.3-6.4 for further details.)

- Jordan: Local investors and manufacturers
- Saudi Arabia: Financial investors involved in their country's manufacturing sector
- Germany: Large TDM manufacturers

The profile of the targeted investment project is as follows. (See Section 6.4 for further details.)

- Project Size (including buildings): \$5 million
- Employment: 70 workers
- Markets: > 60% of exports to regional markets
- Typical product categories: Dies of base metal, molding patterns, molds for metal or metal carbides, molds for mineral materials, molds for rubber or plastic manufacture of semi-conductors

The suggested three-year targets for the effort to attract investment in this sector are as follows. (See Section 6.5 for further details.)

- Cumulative number of projects: 4
- Total employment: 312
- Total investment: \$23.1 million

If Jordan wishes to fully develop its manufacturing sector and all its linkages, it must first develop its TDM subsector and attract investment to it. The lack of these linkages has been identified, time and again, as a major impediment to the country's development. For this reason, promoting investment in the TDM subsector is important not only for the relatively modest returns that it promises in terms of employment and investment, but also for the degree that it will improve Jordan's industrial competitiveness, with the potential for substantial multiplier effects.

## CHAPTER 1: INTRODUCTION

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### 1.1 Background and Definition

Precision Engineering (PE) is the discipline that seeks to eliminate margins of error in all aspects of manufacturing and design. Understood in this way, PE is as much of an attitude as it is a technique, a science, and an industry.

Precision – the ability to ensure the accuracy and repeatability of a mechanism or process – is of utmost importance in a world increasingly defined by high technology, in which sophistication and product differentiation are vital to a country's ability to compete in economic terms over the long term.

As a technique, PE is characterized by painstaking attention to detail. It is the end result of an engineering process which has precision built in at every stage. As a science, it underlies the creation of precision machinery. It is an interdisciplinary field, in which mechanics, optics, and electronics penetrate each other. As an industry, PE constitutes a sizeable and growing segment of the modern world economy, and increasingly operates on an international basis, both in terms of manufacturing and design.

Therefore, it can be said that PE is a precision process that requires both precision machines and knowledge of the variety of measurement, fabrication, and control methods required to manufacture precision products. These products and procedures are characterized by smallness, dynamism, computer control, and as an end result, precision. While precision is intangible, it is measurable, and the smaller the tolerances or margins of error, the more precise the end product will be.

### 1.2 Industry Classifications

PE, as this discussion illustrates, is simultaneously a process, a mechanism, and a product. Therefore, the industry spans a wide range of product categories, which include the following.

- Final products of precision manufacturing, such as watches, clocks, and electronics; medical and optical instruments; measuring and photographic equipment
- Precision-made components of final products, such as the components of appliances, automobiles, drip-irrigation flow-meters, and so on
- Precision machinery and equipment such as TDM

These categories, however, overlap and feed into each other. For example, the die that is used to precision-manufacture a watch must itself be precision manufactured.

The International Standard Industry Classification (ISIC) system classifies most precision engineering activities under divisions 28, 29, and 33 of its manufacturing sector classification. Table 2.1 lists these activities and the four-digit ISIC codes that apply to each of them.

**Table 1.1: ISIC Codes of Precision Engineering**

Code	Description
<b>Division 28: Manufacture of fabricated metal products</b>	
2893	Manufacture of cutlery, hand tools, and general hardware
<b>Division 29: Manufacture of machinery and equipment</b>	
2922	Manufacture of machine tools
2923	Manufacture of machinery or metallurgy
2929	Manufacture of other special purpose machinery
<b>Division 33: Manufacture of medical, precision, and optical instruments, watches and clocks</b>	
3311	Manufacture of medical and surgical equipment and orthopedic appliances
3312	Manufacture of instruments and appliances for measuring, checking, testing, navigating, and other purposes
3313	Manufacture of industrial process control equipment
3320	Manufacture of optical instruments and photographic equipment
3330	Manufacture of watches and clocks

Source: UN Statistics Division

### 1.3 Study Focus: TDM

This study will focus on TDM, which is included in ISIC codes 2893, 2922, and 2929. TDM is a major input in most manufacturing processes and an important part of the manufacturing sector's backward linkages. Due to the rapid pace of technological development, TDM plays a growing role in achieving real precision in the production of any final product.

Therefore, if Jordan wishes to fully develop its manufacturing sector and all its linkages, it must develop its TDM sector and attract investment to it. This is especially true since the lack of these linkages has been identified, time and again, as a major impediment to the country's development. Furthermore, Jordan already has the nucleus of a TDM sector that is waiting to be developed.

TDM is used in metal stamping, die-casting, and plastics molding industries to give the final shape or form to the items being produced. In industry usage, tools include dies, punch tools for dies, industrial molds, jigs, and fixtures.

Dies are used to produce a wide variety of metal stampings, extrusions, forgings, and drawn products, including wire. Stampings are used as parts in the production of motor vehicles, aircraft, furniture, construction and farm equipment, appliances, electrical connections, and so on.

Industrial molds are used to produce a wide variety of plastic, metal, rubber, glass, and mineral products. These include plastic and metal parts for motor vehicles, aircraft, appliances, electronics and electrical products, house wares, consumer products, furniture, military items, and medical products. Molds for plastics include a variety of types including injection and blow molds, with the most widely used being injection molds.

Molds and dies are similar to some extent in exterior appearance as both are usually produced as reverse-representations of the objects or shapes to be manufactured. In practice, however, molds generally come together and pull apart on a horizontal plane, whereas dies come together and pull apart on a vertical plane as the strike force of the press is aided by gravity.

TDMs vary in terms of physical dimensions, sophistication, and functionality, and serve a diverse range of customers and industries. Some TDMs are also more precise than others, and therefore allow lower tolerances.

In a typical process for manufacturing TDM, designs are made with computer-aided-design (CAD) software, while production of components is done using machinery that is run by

computer-aided-manufacturing (CAM) software. Machine tools, some of which incorporate advanced computer-numerated control (CNC), are then used to polish and cut these parts before they are assembled and fit together.

## **1.4 Objective**

The objective of this consultancy is to work with JIB to evaluate Jordan's competitive position in the precision engineering industry, in light of global trends that influence the industry, and to develop an appropriate three-year strategy to promote inward investment.

## **1.5 Methodology**

The authors of this study undertook the following steps in their research for this report.

- Review of available literature, which included but was not limited to literature mentioned in the consultants' original scope of work
- Interviews with selected stakeholders in the local market
- Desk research on global and regional electronics-assembly industry trends
- SWOT analysis of Jordan's TDM industry, as well as other areas of Jordanian manufacturing

Chapter Two is an overview of manufacturing and precision engineering in Jordan, which identifies trends in local investment and trade, existing market access agreements, major players, operational costs and efficiency, and available technology and technical expertise. The purpose of this overview is to provide the reader with a baseline understanding of the current capacities of this sector in Jordan.

Chapter Three is a review of the global TDM industry followed by a brief discussion of Jordan's main competitors within the region, in order to identify Jordan's current potential to attract FDI and to identify the sector's major importers and exporters.

It is important to note that this study aims to identify niche products and markets that can attract FDI to Jordan. It is not a conventional sectoral study, but rather one that seeks to offer a practical plan to enable JIB to approach potential investors. Therefore, the sectoral analysis components of this study serves only as a means to identify target markets and provide profiles of potential investors who may be attracted to invest in Jordan.

In Chapter Four, these local, global, and regional overviews are used as basis for a SWOT analysis for the precision engineering sector in Jordan, and how it compares to its rivals in the global marketplace. This SWOT analysis identifies product and market niches in which Jordan has comparative advantages over its competitors. On the basis of this analysis, the authors make recommendations about the product types on which JIB should focus its targeting efforts.

Chapter Five offers a practical three-year strategy JIB can follow to identify and approach prospective investors, in order to promote the benefits of Jordan's TDM services and products to them.

Finally, Chapter Six summarizes and concludes the authors' analysis of Jordan's precision engineering and tooling industry, as well as the strategy they propose to encourage FDI and DDI, and to support the sector into the future.

## CHAPTER 2: LOCAL OVERVIEW

### 2.1 Role of Precision Engineering in Jordan's Economy

Manufacturing plays a significant role in Jordan's economy, accounting for 16.8 percent of the country's total output or Gross Domestic Product (GDP) in 2002. The sector employed more than 11 percent of the country's labor force and generated almost two-thirds of all exports that year.<sup>1</sup>

Jordan's remarkable rate of real economic growth, which reached five percent of GDP in 2002, is largely driven by the expansion of manufacturing, in particular by the country's spectacular increase in the production of garments. Manufacturing grew at an impressive rate of 10.7 percent in 2002, up from the already impressive growth rate of 10 percent in 2001.

Within manufacturing in Jordan, food and tobacco processing, cement production, and mining (especially of phosphates and potash-related extraction and processing) are the country's leading industries, as illustrated in Table 2.1. Most of these activities are concentrated in the regions of Amman and Zarqa

**Table 2.1: Jordan's Top Ten Industrial Activities in 2002**

Product	Weight in Industrial Index (%)
Food items	14.7
Tobacco	11.0
Cement Lime and Plaster	9.8
Potash	7.9
Phosphate	7.4
Pharmaceuticals	5.0
Clothes and Textiles	4.6
Petroleum products	3.9
Plastic products	3.4
Fertilizer	3.2

Source: Central Bank of Jordan

Engineering makes only a limited contribution to Jordan's economy, despite the fact that it boasts the highest level of registered firms, capitalization, and employment of all manufacturing subsectors in the country.

This is primarily because it is an industry of small, family-owned firms. Of the country's 3,160 industrial engineering firms, only a handful has more than 200 employees, and only three have over 500. Less than a third of these firms have more than 1 million Jordanian dinars (JD) in annual sales.<sup>2</sup>

According to the Amman Chamber of Industry, there are around 1,480 active establishments in the engineering and metals sector in Jordan, employing some 15,295 workers or 11 percent of the total manufacturing sector workforce. The sector's sales in Jordan amounted to JD250 million in 2001, an increase from JD227 million in 1995. Meanwhile, the sector's combined exports and re-exports were JD150 million in 2001 or 15 percent of total manufacturing exports, up from just under JD66 million in 1995.

Despite this growing activity, none of the engineering sector's individual products, which include TDM, make the list of Jordan's top exports, as can be seen in Table 2.2.

<sup>1</sup> Central Bank of Jordan. "Monthly Statistical Bulletin," August 2003.

<sup>2</sup> Federation of Jordan Chambers of Industry.

**Table 2.2: Jordan's Top Five Exports by Value and Percentage in 2002**

Commodity	Value (JD million)	Percentage of total exports (%)
Textiles and clothes	374.6	24
Pharmaceuticals	142.7	9.2
Potash	136.7	8.8
Phosphate	96.5	6.2
Vegetables	95.2	6.1

Source: Department of Statistics

Based on the statistics in Tables 2.1 and 2.2, we can conclude that the manufacturing of TDM does not rank among Jordan's major industrial outputs, either in terms of export value or in terms of total value added to the country's economy.<sup>3</sup>

## 2.2 Demand and Investment Conditions in Jordan's TDM Sector

Jordan's domestic market for TDM is small, despite the country's sizeable plastics industry, which requires molds for its manufacturing processes. While there are more than one hundred workshops manufacturing TDM in Amman, Irbid, and Zarqa, they are all small and family-owned firms, with the exception of two larger ones. A number of manufacturing firms have their own in-house TDM workshops.

Table 2.3 details economic activity in the TDM sector in 2001, broken down by ISIC code, based on a survey of economic activity by the Department of Statistics (DOS). According to this survey, the total gross value generated by the sector is less than JD3.2 million. However, given the market's structure and the lack of adequate information about the industry, it is possible that these numbers underestimate the actual contribution of this sector to the country's economy.

**Table 2.3: Role of TDMs in Jordanian Economy in 2001**

Code	Number of Firms	Number of Employees	Gross Output (JD)	Gross Value- (JD)
2893	36	429	2,931,800	992,600
2922	10	60	2,070,400	1,469,400
2929	5	89	1,531,100	715,600

Source: Department of Statistics

In both 2002 and 2001, Jordan imported TDMs worth around JD6 million. In 2002, however, it exported some JD2.1 million of TDM, down from JD7.5 million in 2001, constituting a surplus in the country's trade of TDMs for that year. Table 2.4 illustrates Jordan's TDM trade activity in 2001 and 2002.

<sup>3</sup> Central Bank of Jordan. "Monthly Statistical Bulletin," August 2003.



**Table 2.4: Jordan's TDM Trade in 2001 and 2002 (Values in JD)**

HS Code	Description	Year	Imports	Exports	Re-exports
401699100	Articles of vulcanized rubber other than hard rubber	2002	324,083	39,922	17,653
		2001	258,150	44,999	21,205
681510000	Non- electrical articles of graphite or other carbon	2002	1,615	0	63,496
		2001	2,566		
690310900	Other refractory ceramic goods such as retorts, crucibles, muffles, nozzles, plugs, supports, cupules, tubes, pipes, sheaths and rods, other than those of siliceous fossil meal or of similar earths, containing by weight more than 50 percent of graphite or other forms of carbon or of a mixture of these products, other than of a kind used for laboratories	2002	21,784	0	0
690320900	Other refractory ceramic goods such as retorts, muffles, nozzles, plugs, supports, cupules, tubes, pipes, sheaths and rods other than those of siliceous fossil meal or of similar siliceous earths, containing by weight more than 50 percent of alumina (al <sub>2</sub> o <sub>3</sub> ) or of a mixture or compound of alumina and of silica (sio <sub>2</sub> ), other than those used for laboratories	2002	7,551	0	0
		2001	8,216	0	0
690390900	Other refractory ceramic goods such as retorts, muffles, nozzles, plugs, supports cupules, tubes, pipes, sheaths and rods, other than those of siliceous fossil meals or of similar siliceous earths other than those of a kind used for laboratories	2002	53,060	0	35,884
		2001	41,795	0	23,357
702000000	Other articles of glass	2002	381,859	0	86,961
		2001	360,521	20,000	384
820720900	Dies for drawing of extruding metal, and parts thereof, of base metal	2002	214,612	0	72,784
		2001	494,665	3,393,722	60,381
820730900	Tools for pressing, stamping or punching and parts thereof, of base metal	2002	194,805	0	3,292
		2001	932,103	0	0
843699000	Parts of a kind used for agricultural, forestry or bee-keeping machinery, including germination plant fitted with mechanical or thermal equipment	2002	13,499	0	0
		2001	69,880	0	0
843890000	Parts of machinery for the industrial preparation or manufacture of food or drink other than for the extraction or preparation of animal or fixed fats or oils	2002	597,522	0	163,584
		2001	316,808	45,658	225,514
846620000	Work holders	2002	28,814	0	0
		2001	9,771	0	0
847590000	Parts of a kind used for machines assembling electric or electronic lamps, tubes or valves or flashbulbs, in glass envelopes, machines for manufacturing or hot working glass or glassware	2002	10,162	0	45,000
		2001	19,740	0	0
847790900	Parts of machinery for working rubber or plastics or for the manufacture of products from these materials, not elsewhere specified or included	2002	209,146	115,532	82,858
		2001	215,737	11,950	14,929
847990990	Other parts of machines and mechanical appliances not for industrial or agricultural use	2002	1,161,480	9,843	730,935
		2001	834,401	6,000	145,009
848010000	Molding boxes for metal foundry	2002	74,724	0	0

		2001	125,184	0	0
848020000	Mold bases	2002	27,454	0	0
		2001	9,104	0	0
848030000	Molding patterns	2002	126,769	1,747,299	0
		2001	111,758	762,042	0
848041000	Molds for metal or metal carbides, injection or compression types	2002	54,792	0	0
		2001	105,484	0	20,569
848049000	Other moulds for metal or metal carbides other than injection or compression types	2002	218,632	0	0
		2001	97,312	471,840	0
848050000	Molds for glass	2002	0	0	19,963
		2001	84,779	0	0
848060000	Molds for mineral materials	2002	874,510	27,664	76,228
		2001	1,138,766	2,001,595	91,903
848071100	Molds for rubber or plastics, injection or compression types, for the manufacture of semiconductors	2002	250,507	0	424,050
		2001	114,251	632,570	149,997
848071900	Molds for rubber or plastic, injection or compression types, other than those for the manufacture semiconductor devices	2002	681,445	99,213	192,620
		2001	610,595	96,318	150,043
848079000	Other molds for rubber or plastics	2002	482,184	68,317	1,038
		2001	290,882	56,390	65,589
<b>Total</b>		<b>2002</b>	<b>6,011,009</b>	<b>2,107,790</b>	<b>2,016,346</b>
		<b>2001</b>	<b>6,252,468</b>	<b>7,543,084</b>	<b>968,880</b>

Source: Department of Statistics

Imported molds are eligible to enter Jordan free from duties as industrial inputs under the Investment Promotion Law of 1995. However, the raw materials used to produce molds locally are subject to custom duties, which makes local production of TDM expensive in comparison to some imports, especially from Asia.

Five or six years ago, Jordanian manufacturers primarily imported new and expensive molds duty-free from Western Europe. Currently, they are more likely to import cheap molds from India, China, and Syria or to buy cheap, second-hand TDM from Taiwan.

Most local manufacturers are more price-sensitive than quality-sensitive and have therefore favored imported TDM over locally produced ones. Until recently, manufacturers have preferred cheaper alternatives to expensive or moderately-priced molds whenever possible.

However, confidence in locally produced TDMs has increased, generating domestic demand for the products of both larger and smaller firms. There are currently around 30 CNC milling machines in Jordan, which attests to the manufacturing industry's increasing sophistication.

### 2.3 Linkages Within Jordanian TDM Sector and with Related Industries

In recent years, Jordan has taken steps to enhance the technical capabilities of its manufacturing sector. The Specialized Training Institute for Metal Industries, for instance, is one of main ventures of The Vocational Training Corporation in the Abdullah II Industrial Estates in Sahab, which trains technicians to operate specialized machinery.

This initiative trains workers to operate sophisticated CNC and heat-treatment machinery, and equips these workers with a number of the skills needed for the production of TDM. It combines training at the Institute, both theoretical and practical, with a period of on-the-job training at local factories. The Institute is supported by the Japanese International Cooperation Agency.

In terms of research capabilities, the Royal Scientific Society also has a mold factory that is available for research purposes, but is underutilized.

While Jordan's engineering and metals sector is relatively small and price-sensitive, it is also expanding, which creates a forward linkage for the TDM sector to related industries, especially in manufacturing plastics, electronics, and appliances. However, within the TDM industry itself, very few linkages exist at present and very little interaction takes place among market participants.

## **2.4 Structure of Jordanian TDM Firms and Competition**

### **Small Workshops**

Before 1985, there were almost no small workshops producing TDM in Jordan. However, they have since proliferated and now number around one hundred. They are all family-owned businesses, usually run by individuals with limited educational credentials and concentrated in the areas of Zarqa, Irbid, and Sahab (near Amman).

These small workshops strive to satisfy the needs of local industry and compete with each other, primarily on price. While they have good craftsmen, they suffer from technical limitations, as only a few use computers or CNC machines.

However, the growth in the number of these small workshops over the past 19 years reflects the fact that they have been profitable, despite the fact that evidence suggests their owners lack awareness about opportunities for expansion. Also, no program has been put in place either by government or by manufacturing sector associations to support these small workshops should they wish to expand and export.

### **Large Players**

Jordan has two large makers of TDM: Mold Technologies Corp. (Mold Tech) and Rum Aladdin. Both started operations in the early 1990s and have achieved a good level of technical competence. However, both companies were forced to restructure after bankruptcies and were ultimately bought by other investors. They are still constrained by a small local market, large requirements for investment in machinery, and competition from China.

The frequency of ordering new molds in Jordan is very low. Therefore, neither firm launches new products with much frequency. They do have a presence abroad through exports, but have yet to demonstrate much success in attracting FDI. The only FDI in the sector at present is from Saudi investors in Mold Tech.

#### **Mold Technologies Corp. (Mold Tech)**

Mold Tech was established in 1993 for mold making and was purchased by Saudi investors in 1998. The company currently has 65 employees, of which two-thirds are workshop technicians and the rest work in either engineering or administration. The size of the investment is roughly \$4 million.

Mold Tech produces injection and blow molds, molds with single and multiple cavities, BUC fitters, molds for BET industries, spare parts for molds, and sheet metal presses using CNC and manual machines.

Mold Tech's range of activities covers the whole product cycle in manufacturing, from product design to mold design to manufacturing the mold itself to installing the mold at the client's factory.

The value of a mold designed by Mold Tech over a three-week period is typically \$20,000, while the value of an injection mold designed over a week to ten-day period is commonly

\$4,000. With a design department of three people, Mold Tech designs around six molds a month, depending on price and complexity. Both injection and blow molds require six to eight weeks to manufacture.

Most of Mold Tech's knowledge base is local. Since it takes around six months for a fresh graduate in mechanical engineering to complete a design, the firm does its best to retain staff through incentives such as training in and exposure to new ideas (e.g., attending and sponsoring trade fairs).

Over the past three years, Mold Tech has primarily focused on exports to the Gulf market. The bulk of their production is exported to Saudi Arabia, followed by Egypt, Lebanon, Sudan, and Syria.

In its original form, Mold Tech was undercapitalized, had too many investors, spent a lot on machinery, and was left with minimal operating capital and a weak knowledge base. Even as it grew in technical capacity, it was forced into bankruptcy because it could not make money fast enough to recoup its initial costs.

#### Rum Aladdin

Rum Aladdin is a large local manufacturer of white goods and household appliances, such as gas and kerosene heaters, gas cookers, electric water heaters, and metal office furniture. The company was created through the merger of two limited companies: Rum Metal, founded in 1972, and Aladdin Industries, founded in 1980.

In 2002, Rum Aladdin was bought by the Sayegh Group, Jordan's largest industrial conglomerate, which owns and runs operations that range from the production of paints and chemicals to canning. While Rum Aladdin produces a number of products under license from Italian and British manufacturers, it also has its own brand name and it exports roughly 55 percent of its production.

Rum Aladdin has its own in-house workshop to produce TDM. When high precision was identified as essential prerequisite for the further expansion and growth of the company, the firm bought the land, buildings, and machines of the Nayzak Co., a manufacturer of TDM which had invested in CNC milling and wire-cutting machines, but went bankrupt due to insufficient capitalization, overdependence on commercial loans, and management problems.

Rum Aladdin's TDM facilities are placed primarily at the service of Rum Aladdin and the Sayegh Group, but it does sell some products to the local market. The company plans to export TDM, initially to the Sayegh Group's factories abroad.

The firm has its own TDM workshop, which was established in 1981. To start operations, they brought 32 technicians and three engineers from Taiwan and the Philippines. It took ten years for the firm to build a Jordanian team, but even then the quality of Rum Aladdin's TDMs was not as good as the ones produced by Nayzak.

#### Other TDM Makers

Universal Aluminum and Arab Aluminum are two aluminum manufacturers in Jordan that also have well-developed, in-house TDM workshops to serve their own needs.

## 2.5 Factor Conditions

### Factor Costs and Operational Efficiency

Participants in Jordan's TDM manufacturing sector have identified to the authors four major components of the final price structure of TDM.

- Depreciation (major)
- Design Time (major)
- Machining Time (i.e., running costs and operators' salaries)
- Raw Materials (minor)

Operator's salaries in Jordan's TDM manufacturing sector start at around JD180 a month and typically increase to between JD250 and JD280 a month after three years. Workers with some experience operating CNC machines would start at JD280 a month or more. After ten years, a technician can expect to earn a salary of around JD500 a month.

Jordanian manufacturing is at a disadvantage in terms of labor costs and wages of technicians in comparison with other producers in the region such as Egypt and international ones such as China. It compares favorably, however, with countries such as Turkey, the United Arab Emirates (UAE), Saudi Arabia, and Israel. (See Table 2.5 for further information.)

**Table 2.5: Regional Manufacturing Wages and Salaries<sup>4</sup>**

	Jordan	Egypt	Israel	Saudi Arabia	Turkey	UAE/Dubai
Minimum wage (US\$ hourly)	0.60	0.25	3.90	None		None
Average manufacturing wage (US\$ hourly)	1.95	0.85	11.51	n/a		n/a
Average wage (US\$ monthly)						
Unskilled	120	70		400	300	210
Semi-skilled	141-211	140	1,000	700	520	400
Highly skilled	211-352		2,300			2,000
Supervisors	281-563		4,000			
Social Charges (% of salary)						
Employer	10	26	33-50	0		0
Employee	5	14	10	0		0

Source: AMIR Program. "Jordan Investor Targeting Strategy 2003," July 2003.

Jordan's rates for the rental and sale of serviced land and buildings, as charged by JIEC, are competitive with most other countries in the region, with the exception of Saudi industrial estates in terms of land lease. (See Table 2.6 for further information.)

**Table 2.6: Regional Rental and Sale Costs for Land and Buildings**

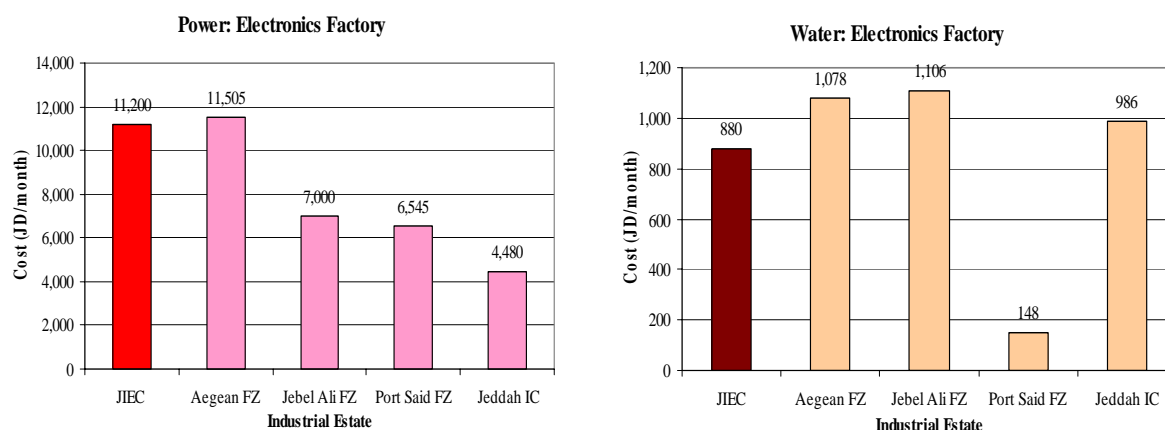
	Serviced Land	Standard Factory Buildings
Al Hassan Industrial Estate	Rental: JD2.5/m <sup>2</sup> /yr	Rental: JD15.4/m <sup>2</sup> /yr
Irbid, Jordan	Sale: JD29.4/m <sup>2</sup>	Sale: Not allowed
Aegean Free Zone	Rental: JD2.57/m <sup>2</sup> /yr	Rental: JD42/m <sup>2</sup> /yr
Izmir, Turkey	Sale: Not allowed	Sale: Not allowed
Jebel Ali Free Zone	Rental: JD2.86/m <sup>2</sup> /yr	Rental: JD67/m <sup>2</sup> /yr
Dubai, UAE	Sale: Not allowed	Sale: Not allowed
Port Said Public Free Zone	Rental: JD2.49/m <sup>2</sup> /yr	Not offered
Port Said, Egypt	Sale: Not allowed	-
Jeddah Industrial City	Rental: JD0.014/m <sup>2</sup> /yr	Not offered
Jeddah, Saudi Arabia	Sale: Not allowed	-

Source: AMIR Program. "JIEC Market Demand Study," April 2002.

<sup>4</sup> UAE/Dubai and Saudi Arabia impose no compulsory social charges, although many companies pay health insurance and education expenses for employees. Since most employees in UAE/Dubai are expatriates, most employers pay or provide housing, transport, repatriation, and end of service gratuities, which can add up to as much as 100 percent of the base salary.

With regard to utility costs for a typical electronics and engineering factory, Jordan is more expensive than its rivals within the region (with the exception of Turkey) in terms of electricity costs, but least expensive (with the exception of Egypt) in terms of water charges. (See Figures 2.1 and 2.2 for further information.)

**Figures 2.1 and 2.2: Regional Power and Water Charges**



Source: AMIR Program. "JIEC Market Demand Study," April 2002.

Finally, transportation costs in Jordan vary in terms of competitiveness. While port-handling charges are fairly competitive within the region, sea freight rates from Aqaba are not very competitive when compared to most of other regional ports. (See Table 2.7 for further information.) Customs inefficiencies, high overland transportation costs, and administrative bottlenecks at Aqaba port also make Jordan less attractive to foreign investors who seek to lower their operational expenses. Therefore, the cost of doing business in Jordan, when taken on its own, cannot be considered a selling point to attract FDI into the country.

**Table 2.7: Sea Freight and Port Handling Charges (JD per 20-foot Container)**

	Aqaba Port	Port Said	Jeddah Islamic Port	Haifa Port	Aegean Port of Izmir	Jebel Ali Port
<b>Average Sea Freight Rates</b>						
New York	1330-2030	420-630	700-945	980-1050	1260	840-1610
Rotterdam	385-420	280-420	315-420	280	525	490-630
Japan	455	840-998	315-420	665	N/A	315-630
<b>Average Port Handling Charges</b>						
	59-67	46	56-72	21	53	77

Source: AMIR Program. "JIEC Market Demand Study," April 2002.

### Available Technology, Technical Expertise, and Training

The technology at the disposal of Jordan's two largest TDM makers, Mold Tech and Rum Aladdin, differs starkly from that available at smaller workshops.

Mold Tech and Rum Aladdin produce injection and blow molds, molds with single and multiple cavities, spare parts for molds, and sheet metal presses using sophisticated CNC machines as well as manual machines. To arrive at the highest possible level of precision, their designs are made using CAD software, while production of components is done using machinery run by CAM software. Machine tools, including computer-controlled machines, are then used to polish and cut these parts before they are assembled.

Most other workshops, in contrast, use mostly low-precision and labor-intensive manual machines and methods in their production.

In terms of technical expertise, Jordan's workers are generally capable and well-educated. Furthermore, there are many engineers in the country. Many engineers and technicians are

bilingual in Arabic and English, with good command of technical English usage. Therefore, Jordan should be able to provide the required local technical expertise to attract investments in this sector.

According to the Jordan Engineer's Association, there are around 50,000 registered Jordanian engineers in all of the profession's specialties. In addition, many Jordanians receive vocational training as technicians and industrial workers.

VTC has a network of 38 training centers and institutes throughout the Kingdom. Training programs are designed to suit the needs of industry, and close relations are also kept with some 4,600 enterprises with a view of implementing training and placing graduates accordingly.

However, some companies have noted the VTC centers do not train students in the latest technology used by factories. On-the-job retraining is required to meet these deficiencies. Another deficiency identified by industry players is the lack of industrial designers in Jordan, which restricts the ability to develop new designs and processes, and raises their costs if industrial designers must be brought from abroad. On the operational level, improper costing has been an issue that plagues companies in this industry.

Of Jordan's total labor force of nearly two million, 1.2 percent is estimated to have had some form of vocational technical training or apprenticeship through the VTC. Currently, the total number of registered students at VTC's 38 centers is 14,000, with females representing approximately 15 percent. From the establishment of the first center in 1976, VTC has graduated over 175,000 trainees. The largest numbers of graduates have studied in the fields of electricity, electrical installation and repair, vehicle and equipment maintenance, mold manufacturing, and air conditioning and sanitary works.<sup>5</sup>

In particular, the above-mentioned Specialized Training Institute (STI) in Sahab helps provide technicians with the skills they require to operate CNC, heat treatment and other machines at a low cost, which adds to Jordan's competitive edge in terms of a technically advanced workforce.

### **Market Access Agreements**

Jordan has signed several agreements that have a bearing on the TDM industry and Jordan's ability to export and attract FDI to this sector. These are the Jordan-U.S. Free Trade Agreement (JUSFTA), the Jordan-E.U. Association Agreement, and the Arab Free Trade Agreement (AFTA), and a number of bilateral free trade agreements with other Arab nations.

JUSFTA authorizes some Jordanian products to enter the United States without duties and quotas. The tariff schedule agreed upon by the governments of both countries calls for the progressive reduction of duties on Jordanian products each year, ending with zero tariffs on most products in 10 years from the start of the agreement in October 2001.

In general, the agreement's rules of origin call for a product to contain at least 35 percent local content, substantial transformation, and direct shipment in order to qualify for duty reductions. (For further detail on the rules of origin for products exported from Jordan to the United States under the terms of this agreement, see the Customs and Border Protection section of the U.S. Department of Homeland Security website, located at [http://www.customs.gov/xp/cgov/import/international\\_agreements/us\\_jordan\\_fta/usjfta.xml](http://www.customs.gov/xp/cgov/import/international_agreements/us_jordan_fta/usjfta.xml).)

The Jordan-E.U. Association Agreement allows Jordanian producers to export products made in Jordan without duty to E.U. countries, provided they meet the minimum 40-percent

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<sup>5</sup> AMIR Program. "JIEC Market Demand Study," April 2002.

requirement for added value and substantial transformation required to be considered Jordanian products.

The agreement encourages the use of European inputs by Jordanian firms, by considering E.U. materials used in production as part of the formula to determine a product's country of origin. The agreement's rules of origin also allow, under the Aghadir Agreement, combining inputs from two countries that have association agreements with the European Union, provided they have free-trade agreements between them. Once this agreement comes into effect, Jordanian products destined for the E.U. market would become significantly more competitive, as they could combine inputs from Turkey, Egypt, or even Israel, as Jordan has recently negotiated successfully with the European Union to cumulate rules of origin with Israel.

Meanwhile, Jordan and other members of the World Trade Organization (WTO) can export TDM to target markets under the benefit guidelines of Normal Trade Relations for WTO members. (See Table 2.8 for further information.)

**Table 2.8: Tariffs on TDMs in Selected Countries in 2002 (%)**

HS Code	United States	European Union	Japan	Canada
401699100	0-2.5	2.5	0	6.5
681510000	0	0	0	3.0-6.5
690310900	0	5.0	3.5	0
690320900	0	5.0	3.5	0
690390900	0	5.0	3.5	0
702000000	0-5.0	3.0	0	6.5
820720900	3.9	2.7	0	0-3.5
820730900	2.9-5.7	2.7	0	0-2.5
843699000		1.7	0	0
843890000		1.7	0	0-2.5
846620000	0-4.6	1.2	0	0
847590000	0	1.7	0	0
847790900	0-3.1	1.7	0	0
847990990	0	1.7	0	0
848010000	3.8	1.7	0	0
848020000	3.4	1.7	0	0
848041000	3.1	1.7	0	0
848049000	3.1	1.7	0	0
848050000	0	1.7	0	0
848060000	0	1.7	0	0
848071100	0-3.1	0-1.7	0	0-6.1
848079000	0-3.1	1.7	0	0-6.0

Sources: USITC Publication 3477 (2002); Journal of the European Communities, L279; Canada Customs and Revenue Agency; Japan Tariff Association Customs Tariff Schedule 2002.

As is evident from Table 2.8, tariffs on TDM in developed countries are low or non-existent, especially exports from the areas in which Jordan has a manufacturing base it hopes to further develop, such as HS Code 8480 (i.e., regular molds made of metal).<sup>6</sup> Therefore, market access agreements with the United States and European Union are unlikely to create a great incentive for investment in Jordan's TDM industry.

Jordan has also signed a number of regional trade agreements, such as AFTA and bilateral agreements with several Arab countries. AFTA came into effect on 1 January 1998, with the aim of creating an Arab Free Trade Area within ten years. Fourteen Arab countries joined AFTA, and the tariff reductions of 10 percent annually mean that goods traded among AFTA

<sup>6</sup> Molds made of rubber are classified under HS 40; of graphite or carbon under HS 68; and of ceramic under HS 69; and of glass under HS 70.



members pay customs duties that are 60 percent less than those levied on other countries' goods.

Jordan already exports TDM to neighboring countries such as Lebanon, Saudi Arabia, and Egypt. Bilateral agreements with a number of these countries have already quickened the reduction of tariffs mandated by AFTA.

For example, under the Jordan-Egypt bilateral FTA, tariffs are already 80 percent lower than they were in 1998, well ahead of the 60 percent reduction mandated by the AFTA timetable. Of these agreements, the ones with Saudi Arabia, Egypt, UAE, and Syria are the most significant. However, since most neighboring countries, such as Lebanon and Saudi Arabia, treat TDM as important industrial inputs, they are generally already exempt from customs duties. Therefore, Jordan's regional market access agreements are also not significant factors in the attraction of FDI or DDI to the TDM sector.

## CHAPTER 3: GLOBAL AND REGIONAL OVERVIEW

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### 3.1 Global TDM Market Characteristics

#### Characteristics, Trade, and Location

The TDM or tooling industry is truly global in scope, as nearly all manufacturing industries rely on the services and products of TDM makers. Production methods range from traditional manual procedures to highly automated production techniques.

For this reason, the existence of TDM production in a particular location does not depend initially on the availability of sophisticated technologies, a pool of educated workers, or the immediate economic environment. At the same time, since the TDM sector is a cornerstone of manufacturing, countries with large and well-established industrial bases are more likely to have larger and more developed TDM industries.

The trends that govern the current migration of manufacturing across the globe is a key factor in the development and growth or the demise of TDM production in various regions. In addition to common macroeconomic influences, global TDM companies share similar commercial pressures: producers around the globe concur that they face constant challenges to reduce costs and shorten delivery times within the context of an increasingly competitive and dynamic global market.

#### Top TDM Producers

Comprehensive data on the worldwide production of TDM does not exist, but Japan is generally considered to be the world's largest producer, followed by the United States. Other top producers of TDM are Germany and China.

The United States, Germany, and Japan represent the pinnacle of achievement in the TDM industry in terms of product quality and characteristics. German TDM producers have a reputation as leaders in workmanship, design, and operation, with core competencies in high-technology and high-precision dies and molds, as well as expertise in creating durable tooling for high-volume applications. The Japanese industry, with its multiple manufacturing linkages and emphasis on research and development, also enjoys a reputation for producing good quality tooling for a variety of end uses.

Despite the advantages enjoyed by these leading producers, TDM industries in other regions, especially Asia, are also established and quickly developing. TDM producers in some of these emerging countries enjoy a so-called "latecomers' advantage," in that they reap the benefits of state-of-the-art production machinery and modern computer software packages that allow them to advance rapidly into the production of complex and complicated tooling.

Lower wage rates are also a competitive characteristic of many developing producers. Although production data that would enable direct comparisons is unavailable, China is estimated to be the world's third-largest producer of TDM. Furthermore, production from China has increased substantially in recent years, whereas production in many other countries has been flat or declining.

In terms of global trade, the world's top exporter of TDM appears to be Japan, in large part because of the substantial number of transplanted Japanese around the world who rely on Japanese sources for TDM. The United States, with its vast consumer market and large number of domestic and foreign automotive operations, is widely considered to be the world's top importer of TDM.

## **Tariffs and Cost Basis**

Tariffs are generally low in the TDM sector. (See Table 2.5 for further information.) Many TDMs are free from tariffs in the United States, with tariffs on dies ranging from 2.9 percent to 5.7 percent of value and on molds from 0 to 3.8 percent. Like the United States, the European Union's tariffs on TDM are relatively low, ranging from 0 to 5 percent of value. By contrast, tariffs in China and Taiwan are relatively high, ranging from 0 to as much as 19 percent and 11.5 percent of value, respectively.

Since price is largely a function of production costs, TDM producers constantly strive to minimize these costs. Despite the significant capital investment in equipment required by this industry, labor is the largest single component of production costs for TDM producers in high-income countries and a significant component of production costs in all countries.

China, Portugal, Hong Kong, Taiwan, and Korea are the global producers of TDM with the lowest labor costs. In China, for instance, hourly compensation costs for toolmakers and tool designers are one-twelfth of those in the United States, while in Taiwan they are one-third.

With regard to material costs, TDM producers often purchase certain materials, such as specialized tool and mold steel, from a limited number of suppliers worldwide. Prices are believed to be approximately the same. However, steels that are more readily available may vary significantly in price in different national markets, and the scale of purchases may introduce pricing differentials for all materials among TDM producers.

## **Competitive Challenges**

The tooling industry faces challenges that, when taken together, amount to a full paradigm shift for what has been a highly traditional sector. This shift is taking place because many of the challenges faced by the manufacturing sector worldwide are compounded by the unique characteristics of this sector, which make it even more vulnerable to competitive forces.

Worldwide, the TDM industry is characterized by small, family-owned businesses that have limited financial resources and commonly employ fewer than 30 employees. Because of this frequently localized nature, TDM producers have been ill-suited to weather the storms of globalization and over the past few years have faced intensified versions of the following challenges that plague the manufacturing sector as a whole.

- Increasingly competitive market conditions have driven manufacturers of consumer goods to rationalize all aspects of production, including the procurement of TDM, with resultant downward pricing pressure on tooling producers, especially for makers of molds used in the production of automotive goods, household appliances, house wares, and electronics.
- For many items that are easy to ship, such as small appliances and consumer electronics (e.g., air conditioners, radios, vacuum cleaners, power hand tools, televisions, and telephones), it has become cost-effective for manufacturers to produce in low-cost locations, such as Asia, for shipment to the U.S. and E.U. markets. This has adversely affected toolmakers in the United States and European Union, who no longer supply the tooling for many of these items because TDM sourcing has shifted to the new locations of production, along with the manufacturing.
- Competitive pressures have led to the compression of product cycles in key industries, such as automotive, appliances, electronics, and telecommunications. This has forced toolmakers to adapt to these product cycles by shortening their lead times to supply tooling to Original Equipment Manufacturers (OEM). In many cases, shortened lead times have favored toolmakers in Asia, who frequently operate their plants 24 hours a day to supply customer orders.

## **Global Trends**

In light of these challenges and developments, the authors have identified the following major trends in the global tooling industry.

- Competition from low-cost producers
- Shifts of production by customers in high-income countries to cheaper production locations, such as China, South Korea, Taiwan, and Eastern Europe
- In the short term, therefore, there are likely to be a significant number of firms exiting the industry in the industrialized countries
- Increased emphasis on price as the leading factor of competition
- Increased importance of quick delivery times and product quality
- Improved productivity, capacity, and competitiveness as a result of relentless technological advances
- Increasing need for highly skilled labor
- Industry consolidation is likely to change the character of the global TDM industry from one dominated by small, often family-owned businesses to one with fewer large major players
- Because advanced TDM production technology is now universally available, increased productivity is occurring simultaneously in both formerly industrialized and newly industrializing regions

## **3.2 Competitive Conditions in Selected Countries**

### **United States**

The U.S. TDM industry has about 7,000 firms, with more than 90 percent employing fewer than 50 persons.<sup>7</sup> TDM operations are concentrated in areas that have historically supported extensive manufacturing activity, such as Michigan, Illinois, Ohio, California, Pennsylvania, Indiana, and Wisconsin. Many U.S. producers have invested in up-to-date production equipment and sophisticated computer software, resulting in decreasing lead times and increasing productivity and capacity.

Canada is the United States' largest partner in the trade of TDM, accounting for 41 percent of U.S. import value and 34 percent of export value in 2001. Other important trade partners include Japan, which accounted for 33 percent of import value and the E.U., which accounted for nearly 16 percent. Imports from China and Korea to the United States are rising sharply, albeit from low bases.

Adverse conditions in recent years have resulted in downsizing at many firms, according to industry associations, and the exit of as many as 200 firms from the field over the past three years.<sup>8</sup> Shipments and employment in the industry have experienced sharp declines since 2001.

The U.S. TDM industry currently faces several major challenges, including the following.

- The recent downturn in the U.S. economy and its slow recovery
- A shrinking domestic market as manufacturers migrate to foreign locations
- Excess capacity due to reduced domestic market demand and new technologies
- Customer demands for lower prices and more services
- Increasing foreign competition
- Rising costs, especially of labor

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<sup>7</sup> USITC. "Tools, Dies and Molds: Competitive Conditions in US and Foreign Countries," 2002.

<sup>8</sup> Booth News, November 2002.

As demand for tooling is heavily dependent on the introduction of new products in the automotive industry, which absorbs nearly half of all U.S. TDM production, the tooling industry has weakened over the past three years as automotive manufacturers have delayed new product introduction in an effort to bolster their balance sheets. At the same time, many of the industries supplied by U.S. toolmakers, such as appliances, have become very cost-competitive, forcing many tooling customers who produce in the United States to reduce product costs by sourcing their tooling from less-expensive foreign locations.

### **Japan**

Japanese TDM producers are experiencing many of the same difficulties as U.S. firms, including a shrinking domestic market, excess capacity, increased competition from lower cost Asian suppliers, and severe cost and time pressures.<sup>9</sup> Moreover, the transfer of technology via overseas training initiatives and the transfer of TDM designs, data, and production techniques to foreign producers has contributed to the erosion of the TDM industry in Japan and has helped overseas suppliers improve their capabilities and competitiveness in comparison to domestic firms. In addition, the industry in Japan is dominated by small producers, who often lack the financial resources and marketing skills necessary to compete in the global market.

A tenuous but lingering strength of the Japanese industry is the endurance of *keiretsu*, or hierarchical relationships among TDM firms within domestic subcontracting and between domestic TDM producers and Japanese OEMs and transplants. Furthermore, Japanese producers have applied niche market and specialization strategies effectively to secure work and increase their competitiveness.

### **China**

China's large and growing TDM industry is estimated to be the world's third-largest by value after Japan and Germany and second-largest by volume after Japan. About 70 percent of China's TDM industry production is integrated, allowing such companies to provide both tooling and parts production.

Unlike other major TDM producers, China has a substantial number of large, foreign-invested TDM producers. Foreign investment has largely resulted from integrated foreign tooling suppliers following their customers to China.

China's TDM industry has the advantages of a low-cost and well-educated labor force and a large, growing domestic and international customer base. Chinese wages for toolmakers are among the lowest in the world. Its disadvantages include a lack of sophistication and creativity in tooling design, high costs for imported inputs, and low quality domestic TDM inputs. Currently, China appears to have difficulty producing high-precision and complex TDM, but is capable of producing low-cost TDM of low and medium precision and complexity.

### **Taiwan**

The current production and design capabilities of TDM producers in Taiwan are primarily based on technologies transferred by Japanese companies that invested in Taiwan in the 1960s and 1970s and trained Taiwan toolmakers. Such training allowed the Taiwan TDM industry to advance rapidly from the production of simple products to the manufacture of medium-precision and more complex TDM. Taiwanese producers are known for their short lead times and competitive prices.

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<sup>9</sup> ERI, JSPMI. "Assignments and Future Prospects for the Die and Molds Industries," March 2002.

A number of Taiwanese firms operate manufacturing facilities in China. The combination of manufacturing in China with design and business functions in Taiwan allows TDM firms to take advantage of low wage rates while controlling key processes. Taiwanese firms are also strong in terms of computerization and international sales and marketing.

At the same time, the relocation of many manufacturing industries from Taiwan to lower-cost production locations such as China has been said to hurt those firms that continue to manufacture TDM domestically.

Taiwan is a big exporter to the Middle East of inexpensive manufactured goods that cover a wide range of prices and quality. Its producers maintain basic, but insufficient tolerance, and they have had some problems with design and selection of material. Also, because of language problems, it has sometimes been difficult for Arab manufacturers to communicate with Taiwanese TDM makers.

### **European Union**

Taken as a whole, the E.U. region would likely rank as the largest producer and consumer of TDM in the world, with a relatively small number of tooling producers in each E.U. member country. The region's three leading tooling industries are in Germany, Italy, and Portugal.

The principal issues that affect TDM makers in the region's traditional producing nations of Germany, Italy, the United Kingdom, and France, include rising labor costs and a migration of E.U. customers to lower-cost production locations in emerging markets. E.U. customers have shifted production to Spain, Eastern Europe, and Asia. High-cost E.U. tooling producers are turning to FDI to take advantage of lower labor costs in Spain, Portugal, and Eastern European countries such as the Czech Republic, Poland, and Hungary.

### **Germany**

Germany ranks as the European Union's largest importer and exporter of TDM. It is a world leader in the production of high-precision and highly complex TDM. Germany is also one of the largest producers of tooling in the world. Since high labor costs and labor regulations hamper German TDM producers, they have focused on high-precision and complex TDM. In this regard, the German tooling industry benefits from a strong tradition of craftsmanship, as well as strong apprenticeship training programs and extensive TDM research and development efforts.

### **Portugal**

Despite Portugal's small size, it has emerged as one of the world's leading exporters of industrial molds. In 2001, despite limited production of dies, Portugal was the eighth-largest producer of dies and molds in the world, and it exports to more than 70 countries.

The success of Portugal's TDM industry in exporting and in adoption of the latest computer technologies has occurred despite the fact that Portugal has a small industrial base on which the TDM industry can depend. This is explained by the Portuguese sector's high level of specialization, especially in making precision molds for the plastics industry, its quick lead times, and its specialized training colleges and research centers.<sup>10</sup> Since joining the European Union in 1986, Portugal has focused on serving customers in the European common market.

Table 3.9 lists the major producers in the global TDM sector and the challenges they face.

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<sup>10</sup> Catarina Selada (ITEC), Alexandre Videria (ITEC), José Rui Felizardo (ITEC), and Francisco Veloso (MIT). "The Technology and Innovation Audit in the Portuguese Moulds Sector: Analysis of the Main Results," Massachusetts Institute of Technology (<http://www.web.mit.edu/~fveloso/www/research.html>).

**Table 3.1: Challenges Facing Global TDM Producers**

Producer	TDM Industry Status	Remedies and Future Plan
United States	Challenged	No consensus plan for guiding the industry due to fragmented representation by several trade associations and small firm size which limits financial resources
Canada	Challenged	<ul style="list-style-type: none"> <li>▪ Priority has been on obtaining government support for training</li> <li>▪ Otherwise, no future industry action plan is publicly available</li> </ul>
Japan	Challenged	<p>Increased government awareness of issues affecting the TDM industry and interaction with TDM industry associations. Defined tasks for industry renewal include the following.</p> <ul style="list-style-type: none"> <li>▪ Greater cooperation with academia</li> <li>▪ Formation of consortium among firms</li> <li>▪ Optimization of subcontracting</li> <li>▪ Concentration by technological fields</li> <li>▪ Greater introduction of computer technologies</li> <li>▪ Better foreign market intelligence</li> <li>▪ Reductions in TDM firms' high cost structure, and</li> <li>▪ Protection of intellectual property rights relating to the transfer of TDM design and production process technology by customers</li> </ul>
Taiwan	Challenged	<ul style="list-style-type: none"> <li>▪ Trade association emphasis on TDM design capabilities and worker training</li> <li>▪ Focus on TDMs for the high-end of the market</li> <li>▪ Continue to leverage production capabilities in China with headquarters and design operations remaining in Taiwan</li> </ul>
China	Growth	<ul style="list-style-type: none"> <li>▪ Trade association emphasis with government support, focused on improving management practices and worker training, as well as upgrading TDM industry technology</li> <li>▪ Many firms in the industry, particularly foreign-invested TDM producers, intend to produce high-precision and increasingly complex TDMs with higher levels of quality</li> </ul>
Hong Kong	Growth	<ul style="list-style-type: none"> <li>▪ Continued integration of the industry with Chinese production operations</li> <li>▪ Industry and Government focus on rapid-prototyping, rapid-tooling, and (R&amp;D)</li> </ul>
European Union	Split	<ul style="list-style-type: none"> <li>▪ Continued support of R&amp;D efforts</li> <li>▪ Enhancement of cross-border cooperation and grouping among mold makers in France, Portugal, and Spain; this initiative is within a large set of projects in the area of subcontracting by the EU Directorate on Enterprise</li> <li>▪ Previous efforts included the benchmarking of the EU industry against Japanese and Taiwan TDM producers</li> </ul>
Portugal	Maintaining competitive edge	Increased emphasis on computer technologies to leverage its current low labor costs and TDM industry experience
Germany	Maintaining competitive edge	Increased collaboration among industry, university, and private research institutes
United Kingdom	Challenged	The UK Gauge & Tool Makers' Association (GTMA) continues to promote the use of World Class Profiles for benchmarking and their role in raising standards throughout the UK TDM industry. According to GTMA, the UK is the only country in the world to have developed specific benchmarking profiles within the tool-making industry. Benchmarking profiles have been established based on world class precision machining and metrology firms (precision machining and metrology are used in tool-making).

Source: USITC. "Tools, Dies and Molds: Competitive Conditions in US and Foreign Countries," 2002/

### 3.3 Regional TDM Industry and Trade

Economic growth in the Middle East, especially the Gulf countries, has fared better than the rest of the world over the past three years, primarily due to higher oil and natural gas prices. Consumer and business demand and confidence suffered in the first few months of 2003, due to the invasion of Iraq, but has picked up substantially since the middle of that year. The Economist Intelligence Unit estimates that the Middle East and North Africa (MENA) region's GDP growth rate was 3.1 percent in 2003, and is expected to rise to 4 percent in 2004.

The Middle Eastern market for tooling is small, when compared to established markets like those in the United States, Europe, and Asia. However, economic liberalization, coupled with the expansion of manufacturing in most of the countries of the region, is sure to create more demand over the long run.

For example, the manufacturing sectors in Saudi Arabia and Egypt have expanded at rates of 2.0 percent and 2.2 percent, respectively, in 2002.<sup>11</sup> In Turkey, plastics consumption and production, which requires dies for manufacturing, has grown at a staggering 10 percent rate for the decade until 2001.<sup>12</sup> The TMD industry in the region is characterized by the existence of small workshops that service each country's local manufacturing sector.

The basis for competition in regional markets is (in order) in terms of price, quality, service, delivery, and lead-times.

Market penetration (especially of the Saudi market) can be achieved through business connections and sustained marketing efforts, since there are no substantial barriers to entry when exporting to any country in the region, with the exception of Syria.

#### Turkey

Turkey has by far the largest TDM market in the region, supporting the country's big and diverse manufacturing base. The Turkish TDM sector is more developed than most of the small workshops in Syria, Egypt, and Jordan, and the country is a large exporter of molds for blown articles and sheet metal, but not injection molds. However, the quality of its output is not the best, and the sector is characterized by primarily small workshops that mostly serve the domestic market.

#### Saudi Arabia

Saudi Arabia is the region's second-largest market, with a large and expanding manufacturing base. It is a big producer and importer of TDM with a market size of some \$100 million. There are approximately four large mold manufacturers, each with an investment size of approximately \$20 million. By regional standards, Saudi Arabia is vast market for plastic manufacturing equipment, especially BUC fitters.

However, TMD production is not currently a priority in Saudi Arabia, which offers opportunities for Jordanian exporters and potential for attracting investment into Jordan. In addition the Saudi market is characterized by a decoupling of ownership and management, as well as a large presence of expatriate workers. Four-fifths of the specialized workforce for TMD production is from India or the Philippines.

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<sup>11</sup> CIA. *World Fact Book*, 2003.

<sup>12</sup> PAGEV – Turkish Plastics Industry Association, 2003. ([www.pagev.org.tr/eng/industry.html](http://www.pagev.org.tr/eng/industry.html))



## Egypt

Egypt's TDM market is also large and has been expanding rapidly since 1995, as the country's large manufacturing sector itself has expanded. Currently, there are more than 50 to 60 CNC machines in Egypt. However, even more so than other countries in the region, the sector consists of small workshops and no major players. TDM makers are not export-oriented and suffer from both a lack of precision and poor product quality. Egypt imports TDM from both Jordan and Syria. Hence, there is demand for better quality imports, representing a potential opportunity for marketing Jordanian exports.

## Syria

Syria's large and protected economy has allowed for the development of a relatively large and expanding market for domestic manufacturing. While production of TDM has occurred since the early 1970s, the past 10 years have seen a substantial boom in this sector, profiting from substantial protection and increased manufacturing activity.

It is primarily comprised of small workshops, but there are a few large firms that export to Saudi Arabia, Lebanon, and Jordan and use state-of-the-art machines. The largest of these is Al-Rasheed Molds, with a facility valued at approximately \$15 million.

There are more than 60 CNC milling machines in Southern Syria alone, mainly in and around Damascus. Syrian TDM products are cheap, but they are neither always oriented to precision, nor of very good quality. Syrian firms are therefore main competitors with Jordanian TDM producers in both local and regional markets at the lower-end of the quality chain.

To conclude the analysis of the regional market, Table 3.10 summarizes some of the factors that are likely to determine each country's potential to attract FDI to the TDM sector.

**Table 3.2: Determinants of FDI Attraction in Regional TDM Sector**

Country	Market size	Labor costs	Skilled labor availability	Facilitation services	Infrastructure and transportation	Developed cluster	FDI
Syria	Medium	Low	Insufficient	Low	Low	No	Low
Turkey	Large	Low	Sufficient	Medium	Medium	Yes	Low
Egypt	Large	Low	Insufficient	Medium	Low	No	Low
Saudi Arabia	Large	Medium	Insufficient	Medium	Good	No	Low

## CHAPTER 4: SECTOR ANALYSIS

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### 4.1 Modern TDM Sector Characteristics

Based on the analysis in the preceding chapters of the structure of the global tooling industry, the trends that shape its future, and the competitive forces it faces, the following general observations about the state of the modern TDM industry can be made.

- It is the ultimate business-to-business industry.
- It requires large capital investment.
- The industry's main cost is the depreciation of TDM manufacturing machinery in less-developed countries, the cost of labor in developed countries.
- The second major cost factor is know-how and skilled labor to make designs and run the machines.
- It is a high value-added industry, as the ratio of raw material costs to final product value is small.
- The modern TDM industry involves economies of scale based on fixed-cost depreciation.
- The industry is experiencing rapid consolidation, and average firm size is on the rise.
- A skilled labor force is a necessity.
- Quality and precision are a requirement for competitiveness and export potential, since production is increasingly shifting to lower-cost Asian producers.
- Shorter delivery and lead times and multiple shift production are important in order to compete.

### 4.2 Investment Location Decision Criteria

In light of these observations, it is logical that when TDM investors decide to establish or to relocate a factory in new areas, they take into consideration the following issues, which are critical for success in the precision engineering industry.<sup>13</sup>

- Sizeable home manufacturing base
- Access to expanding local and regional manufacturing market
- Reasonable overall cost structure (e.g., labor, overheads, taxation)
- Potential for economies of scale (i.e., large-scale production)
- Large investment in modern machinery
- Availability of expertise in design, machine operations, and process optimization
- Availability of skilled workforce
- Culture of accuracy and precision
- Quick lead and delivery times
- Niche, quality, and precision production
- After-sale service and support
- Adequate infrastructure
- Reasonable costs for transportation and utilities

Based on interviews with local participants in the TDM sector as well as industry analysts around the world, the development of a world-class tooling industry in a country is usually based on the presence of a critical mass of world-class tooling firms that strive to do the following.

- Control customer relations
- Pick the right customers

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<sup>13</sup> Based on the analysis in preceding chapters and on interviews with market participants.

- Differentiate their firm with unique products or process knowledge
- Build intellectual capital
- Experiment continuously with new technologies
- Build a lean organization
- Pursue global sourcing and production alliances
- Cost properly

Finally, while the most critical preconditions for a successful TDM industry are technical and firm- and industry-specific, there are also important elements of a country's climate for business that foreign investors take into account when deciding on a location of a new investment, which include the following.<sup>14</sup>

- Economic openness of the jurisdiction
- Transparency and reliability of legal and financial institutions
- Sufficient supply of professional and technical human resources
- Ease of capital repatriation
- Fast-track permit processing to speed the setup of operations
- Investment and financial incentives

### **4.3 SWOT Analysis**

The tables and discussion on the following pages detail the strengths, weaknesses, opportunities, and threats of the TDM sector in Jordan, and how they influence the criteria for investment identified above.

SWOT is a tool for strategic analysis that is commonly used to help organizations and companies understand their competitiveness in a dynamic business environment. It examines internal forces (i.e., strengths and weaknesses), as well as external forces (i.e., opportunities and threats) as they exist in the business environment.

This section identifies both the internal factors (i.e., strengths and weaknesses) that affect Jordan's attractiveness as a destination for FDI, as well as the external factors (i.e., opportunities and threats) that may affect the growth of the TDM industry in Jordan and enhance or reduce the country's ability to attract DDI or FDI.

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<sup>14</sup> World Bank Foreign Investment Advisory Service (FIAS). "Attracting High Technology Investment: Intel's Costa Rican Plant," Occasional Paper No.11, April 1998.

**Table 4.1: Strengths of Jordan's TDM Sector**

Factor	Comment
Available and educated workforce	Availability of a large number of skilled laborers and technicians, in addition to more than 50,000 engineers
Relatively low overall labor costs compared to regional competitors	Adding to Jordan's regional competitiveness, since Jordan's manufacturing labor costs are lower than all regional competitors, except Egypt
Availability of training opportunities	Such as work and study programs through the Specialized Training Institute, which allows the industry to train human resources more efficiently
Bilingual workforce (Arabic and English)	Giving the Jordanian workforce an edge when commissioning molds and dies in Arab countries, since it can communicate with clients in Arabic while having a good command of the required technical English
Tradition of good craftsmanship at small TDM workshops	Illustrating the human resource potential in Jordan's small and fragmented TDM market
Reputation for quality production	Some Jordanian exports, such as those from Mold Tech, enjoy a reputation for good quality, reliability, and precision, coupled with good service in Arab markets.
Fast delivery times	Manufacturing in Jordan offers quicker delivery for sale in the regional market compared to players from outside the region
Lower shipping costs	Manufacturing in Jordan offers cheaper shipping costs when shipping to the E.U. or regional markets, compared to Asian producers.
Good quality infrastructure	Provides a reliable network of roads, electricity, and communication
Specially-negotiated WTO status with regard to tax on export revenue	Allows zero tax on export earnings until end of 2007, which may be extended based on negotiations between Jordan and WTO <sup>15</sup>
Market access agreements with the United States, European Union, and Arab countries	Allowing duty- and quota-free entry of selected products to the world's largest markets and regional ones
Existence of know-how	In form of specialized vocational training centers
Existence of TDM sector nucleus	Jordan has two large TDM players and more than 100 small workshops.

<sup>15</sup> This is based on the decision of the WTO's Committee on Subsidies and Countervailing Measures dated 22 November 2002.

**Table 4.2: Weaknesses of Jordan's TDM Sector**

Factor	Comment
Large number of small, fragmented TDM manufacturing workshops	Prevents these small workshops from handling high-precision and heat-treatment operations
Small domestic manufacturing base in Jordan and insufficient demand	Results in low frequency of ordering new molds compared to the production potential of TDM manufacturing machinery, raising depreciation costs
Price-sensitive local market and price-based competition	Impedes progress to better designs and thus restricts potential for niche export competitiveness
Expensive machines and equipment needed for producing TDM	Requires major initial capital investments, which lowers profitability
Lack of certain special tools and accessories in Jordanian market	Adds to cost and time of production, since they have to be imported
Insufficient number of industrial designers	Prevents factories from improving product designs and processes, constraining competitiveness
Inadequate managerial and costing skills	Results in wasted resources and sometimes bankruptcies
Well-educated, but insufficiently-skilled workforce	Demands on-the-job training, raising operational costs
High labor costs compared to certain global competitors	Detracting from Jordan's global competitiveness, since Jordan's manufacturing labor costs are higher than such major players as China
Expensive know-how for sophisticated designs and niche manufacturing	Increases costs of attempting to tap export markets and restricts ability to innovate
Lack of public or private support programs to develop this sector	Makes financial resources and technical expertise less readily available, and impedes development of cluster, thus increasing overall industry cost structure
Lack of cooperation within industry, which has no association or representative body	Restricts industry players' interaction with each other and prevents them from forming buyer or seller groups in order to lower raw material and marketing costs
Lack of backward and forward linkages	Makes overall cost of final product higher since all components and raw materials have to be imported
Tariffs on raw materials, which raises price of final product, whereas competing imported final products enter Jordan duty-free	Raises cost and price of final product and makes local production less competitive in local market
Long, sometimes complex lead- and delivery-times for steel imports, which are shipped by sea from Sweden, Germany, Italy, or Canada	Results in delays and increases costs
Relatively high utility costs	Increases cost of final product
Relatively slow logistics and customs transactions, especially at Aqaba port	Increases operating costs, delays deliveries to customers, and prevents catering to market segments requiring "quick response"
High transportation costs from Amman to Aqaba (i.e., truck transport costs half as much per container as shipping from Aqaba to New York)	Raises price of final product and lowering competitiveness

**Table 4.3: Opportunities for Jordan's TDM Sector**

Factor	Impact on Jordan
Growing global trend towards outsourcing to lower cost producers	Jordanian manufacturers can become subcontractors of firms looking to outsource to serve Middle East market, especially European firms.
Global industry trend of consolidating into bigger, better-capitalized, and more outward-looking local operations	Foreign firms might consider more seriously investing or outsourcing abroad in locations like Jordan.
Proximity and access to growing local and regional market	Demand by MENA region manufacturers is poised to expand, especially in Saudi Arabia.
Expanding engineering and metals sector in Jordan	Sector's production and exports have grown substantially since 1995, increasing demand for TDM.
Demand for TDM outstrips supply in Saudi manufacturing sector	Developing TDM manufacturing in Saudi Arabia is not a priority. However, demand is growing as manufacturing sector is expanding rapidly.

**Table 4.4: Threats to Jordan's TDM Sector**

Factor	Impact on Jordan
Need to achieve economy of scale for business to become profitable to offset high initial capital requirements of TDM manufacture	This means that Jordan's ability to attract investments in this sector will be constrained by its small manufacturing base.
Increase in local operating costs, such as minimum wage, electricity, and water	Higher costs would drive Jordan out of TDM market, as other countries improve their productivity, communication capabilities, and skills. This is a constant threat, as Jordan is water- and energy-poor.
Continuing competition from cheap, second-hand TDM from Taiwan and increasing competition from China and India in local and regional markets	Jordan's overall cost structure does not allow it to compete head-on with these cheaper producers.

JIB can use an analysis of opportunities to determine target markets and marketing messages for its promotional plans in a similar fashion. It can also take proactive steps to counter the negative affects of threats as they are identified. It is important for JIB to monitor local and international developments with regard to such opportunities and threats, and adapt its promotional plans accordingly.

#### 4.4 Competitive Bechmarking

Based on this SWOT analysis of Jordan's TDM industry, the authors have compared this industry to those found in other countries, which fall into two categories: (1) global competitors, such as China and (2) regional competitors, such as Egypt, Syria, and Saudi Arabia. This comparison was made on the basis of factors that have been identified as high priorities to investors when setting up a new TDM business. It grades the degree to which each country satisfies each criterion, with a grade of A indicating the highest level of satisfaction. The results of this comparison are contained in Table 4.5.

**Table 4.5: Competitiveness of Jordan's TDM Industry**

	Jordan	China	Syria	Saudi Arabia	Egypt	Turkey
Local market size	C	A	B	B	B	A
Local workforce						
Availability	A	A	A	C	A	A
Cost	B	A	A	C	A	B
Technical skills	A	B	C	C	C	B
Operating cost efficiency (a)	B	A	A	B	A	B
Customs procedures	B	C	C	A	B	B
Logistics and transportation	B	B	B	A	B	A
Warehousing costs/facilities	C	A	B	B	B	B
Infrastructure (b)	A	B	B	A	B	A
Tax/profit repatriation regulation	A	B	C	A	A	A
Speed of setting up operation	C	B	A	B	C	B
Perceived country stability	B	B	C	B	B	B
Know-how availability	B	B	C	C	C	B
Culture of precision and accuracy	B	B	C	B	C	B
Duty-free access						
Regional markets	A	N/A	C	B	B	N/A
United States	A	C	C	C	C	C
European Union	A	C	C	C	B	A

(a) Includes minimum wage and fringe benefits for workers, utility costs, and rental costs.

(b) Includes quality and extent of roads and port efficiency, telecommunication quality, as well as reliability of electrical supply. Since these factors are difficult to measure quantitatively, qualitative information in the form of testimonials from manufacturers was used as an indicator.

## Benchmark Analysis

Observations pertaining to investment promotion that may be made from this comparison are as follows.

- Jordan can market itself primarily for the availability of its educated workforce, which includes many technicians and engineers.
- Jordan can also market itself for the technical capabilities, communication and language skills, and know-how of its workforce.
- Jordan can market itself for its proximity and access to a growing regional market.
- Jordan has a better culture of precision and accuracy than others in the region.
- In terms of labor costs and operating efficiency, Jordan is less expensive than Turkey and Saudi Arabia, but more expensive than Egypt, Syria, and China. This could become a disadvantage for Jordan in the future, as other countries strive to improve their competitiveness.
- In terms of logistics and facilitation efficiency, Jordan is more competitive than China, as competitive as a number of regional countries, and significantly less competitive than GCC countries.
- In terms of infrastructure, Jordan is as competitive or more competitive than any country in this comparison. This could be used as a selling point, although it is taken as a prerequisite to investment in today's business environment.
- In terms of perceived country stability, Jordan is perceived as relatively unstable, as it is located between Iraq and Israel/PNA. Many competitor countries are also perceived as relatively unstable. With proper promotion, investment promotion officers can dispel this misconception.
- Jordan's main weakness is its small and fragmented TDM sector operating in an underdeveloped cluster that serves a relatively small manufacturing base. The main implication of this is that Jordan's appeal as stand-alone investment location is limited, especially when factoring in the higher operating costs, expensive raw materials, and less favorable logistics and facilitation services.

## Addressing Perceived Weaknesses

As a part of its promotional effort, JIB needs to emphasize Jordan's strengths and counter inaccurate perceptions about its weaknesses. In order to make such arguments for each strength and weakness, JIB should use a variety of points, all of which must be supported by current and specific evidence from appropriate data sources.

Using two of Jordan's main weaknesses as examples – the country's perceived instability and small manufacturing base in an underdeveloped cluster – the following table demonstrates how this can be done by JIB promotion officers for all of the strengths and weaknesses identified in this report. It includes generic points that can be used to support arguments emphasizing strengths or countering weaknesses, data sources for evidence to support such points, and specific examples of such points. JIB should continuously explore points that it might make, as well as the data sources that provide evidence to support such points.

**Table 4.6: Supporting Strengths and Countering Weaknesses of Jordan's TDM Sector**

<b>1.</b>	<b>Weakness</b>	<b>Perceived country stability</b>
1.1	Generic Point	Real economic growth, which is an indicator of country stability.
	Data Source(s)	Central Bank Monthly Bulletin
	Specific Example	The economy has grown at the rate of 4.7 percent and 5.0 percent in real GDP terms in 2001 and 2002, despite the turmoil in neighboring countries.
1.2	Generic Point	Progressive national leadership and good governance, which is a guarantee of future country stability.
	Data Source(s)	Speeches made by H.M. King Abdullah II, especially in recognized, international venues. (Found on government web sites.) Articles written about Jordan, especially in recognized, international periodicals. (Found in international press.)
	Specific Example	His Majesty King Abdullah II is keen on pursuing actions that consolidate stability and economic growth, as demonstrated by the following quotations from a speech he delivered at Columbia University in September 2000: "We pioneered a democratic experience that is built on solid institutions of law, accountability and justice. We have also provided an example for making peace with our neighbors, a peace that upholds justice and provides security, a peace that creates effective frameworks for regional cooperation in resource allocation." <sup>16</sup>
<b>2.</b>	<b>Weakness</b>	<b>Small manufacturing base in Jordan</b>
2.1	Generic Point	The local and regional manufacturing base has been growing, thus increasing demand for TDM.
	Data Source(s)	Central Bank of Jordan, Ministry of Industry and Trade of Egypt, Saudi Arabia Monetary Authority (SAMA), and so on.
	Specific Example	Manufacturing grew in Saudi Arabia by 2 percent in 2001, while it has grown by 2.2 percent in Egypt during the same period.
2.2	Generic Point	Jordan has signed bilateral market access agreements with neighboring Arab countries, and acceded to AFTA.
	Data Source(s)	Ministry of Industry and Trade
	Specific Example	Many Jordanian products can now enter the Egyptian, Saudi, and even Syrian market at lower or duty-free rates.

<sup>16</sup> <http://www.jordanembassyus.org/09102000001.htm>



## CHAPTER 5: RECOMMENDATIONS

### 5.1 Subsectors and Niches

As the analysis in preceding chapters has demonstrated, Jordan's precision-engineering sector, and in particular its makers of TDM, enjoy competitive strengths that make this industry potentially attractive to foreign investors.

These strengths include a well-educated, bilingual, and inexpensive workforce, with good standards of craftsmanship. The country has a good program for vocational training; good infrastructure for communications, transportation, and utilities; and proximity and access to other markets in the region and to Europe.

In order to be competitive, however, Jordan's TDM industry must first establish a larger manufacturing base that will allow the economies of scale that will in turn justify big initial investments in modern machinery. It should have a cost structure that is reasonable in today's price-sensitive environment, and it should acquire and generate expertise and cultivate strong customer relations, based on quick delivery and lead times, and after-sale services.

Jordan's small domestic manufacturing base and a cost structure that is expensive in comparison to some of its rivals could be compensated for by improving the quality and precision of its products by leveraging local expertise, enhancing after-sale services, and tapping into export markets.

On a technical basis, Jordan has been able to compete in the manufacturing of molds in local and regional markets. Jordan also has a sizeable plastics industry, which is the largest local consumer of TDM. Thus, Jordan is increasingly competitive in manufacturing certain molds and dies, of which it has exported more than \$500,000 a year in 2001 and 2002.

These include exporting dies of base metal for drawing or extruding metal, molding patterns, molds for mineral materials, molds for rubber or plastic, and molds for metal. The growing success of these TDM products in Jordan suggests that the JIB could attract investments, both local and foreign, into these products and subsectors.

Given Jordan's strengths, the country's already existing industrial base in TDM, and its consumption and export patterns, Jordan has the potential to become competitive in manufacturing in certain niches, which are listed in Table 5.1. The authors recommend that JIB initially target these areas for investment promotion. The bulk of these niches fall under the classification of ISIC 2929, which is defined as the manufacture of other special-purpose machinery.

**Table 5.1: Recommended TDM Subsectors for Targeting**

Targeted TDM Subsectors	HS Code
Dies for drawing or extruding metal, of base metal	8207.20
Molding patterns	8480.30
Molds for metal or metal carbides (other than injection)	8480.49
Molds for mineral materials	8480.50
Molds for rubber or plastic manufacture of semi-conductors	8480.71

There is a very slight chance the Jordan-E.U. Association Agreement might induce some Asian TDM companies to use Jordan as a platform from which to supply the European market. However, Jordan's TDM sector is otherwise unlikely to be able to compete in the mainstream U.S. and E.U. markets, despite the Jordan-U.S. Free Trade Agreement. Its biggest prospects to attract investment are either in outsourcing for the E.U. market or in exporting to other markets in the region.

Therefore, Jordan's potential export markets for TDM are other markets in the Middle East as a primary target and Europe as a secondary target.

Since Europe will not be an easy market for Jordan to penetrate, joint ventures or cooperation with European firms might be the best way to attract this type of investment, either by becoming subcontractors of E.U. TMD producers or by assembling or manufacturing parts for European manufacturers.

TDMs are exportable products, but it may be difficult to generate interest in direct investment from abroad in this sector at first, due to the high capital requirements and the fact that most mold- and die-makers are small, family-owned businesses. Certainly at an initial stage it may be easier to generate interest in these types of indirect arrangements.

## **5.2 Outlook for Future Investment**

To be able to make a reasonable forecast of future FDI inflows into Jordan, a number of issues need to be taken into consideration, such as past trends, Jordan's strengths and weaknesses, and opportunities that arise from the changing environment in which the global TDM industry operates.

A review of investment trends in Jordan shows that all of the capital for TDM ventures in Jordan to date has been raised locally, except for the recent acquisition of Mold Tech by Saudi investors.

Looking at the comparative advantages of Jordan based on the SWOT analysis in Chapter Four, one would expect future investments to come from the following sources.

- Local investors wishing to establish export-oriented TDM companies to take advantage of Jordan's skilled labor force and central location
- Financial investors from Saudi Arabia who would contribute capital and leverage local expertise to serve the expanding Saudi manufacturing sector, in which demand outstrips local supply
- European companies wishing to outsource TDM manufacturing or assembly operations to low-cost producers, especially German ones, where there is a high concentration of TDM manufacturers that suffer from prohibitive labor costs

Therefore, in an initial phase, the most likely sources of new investment for Jordan's TDM sector are from the consolidation of the local industry and new DDI. Subsequently, targeting well-connected Saudi Arabian financial investors may yield positive results. Finally, at a later stage, getting German TDM firms to outsource assembly and production operations to existing or new Jordanian TDM outfits seems to be a reasonable and promising course of action.<sup>17</sup>

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<sup>17</sup> It should be noted however that such an endeavor might be difficult. German TDM producers made substantial investments in Eastern Europe in the 1990s. Since these projects failed to satisfy their quality standards, the German TDM producers pulled back and focused instead on local niche production.

## CHAPTER 6: THREE-YEAR INVESTMENT PROMOTION STRATEGY

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### 6.1 Core Message

The most powerful elements of Jordan's competitive advantages in the TDM sector are, in summary, its well educated, skilled, inexpensive, and bilingual workforce; its good vocational training facilities; and its good connectivity and communications infrastructure.

The following statement is one version of core promotional message, based on these advantages, which JIB can build on to articulate a final core message to promote investment in the sector.

*Jordan's skilled and bilingual workforce, specialized vocational centers, and communications advantages enable investors to locate relatively inexpensively and efficiently in a growing local and regional market. Profits derived from export operations are exempt from local income tax, and may be fully repatriated.*

*Jordan's exports in this sector already enjoy a reputation for good quality, reliability, precision, quick delivery times, and adequate after-sale service.*

### 6.2 Principal Selling Points

Based on the SWOT analysis in Chapter Four, the following elements can be identified to differentiate Jordan from its rivals for the attraction of TMD investment.

- Political and economic stability
- Well-educated and skilled workforce
- Proximity to large and growing regional markets (i.e., Saudi Arabia, Syria, and Egypt)
- Existence of specialized vocational training centers
- Reliable communications infrastructure and bilingual workers
- Duty-free access to the Arab, U.S., and E.U. markets
- Favorable investment and tax regulations (i.e., zero income tax on exports and full repatriation of profits)
- Flexibility, service, and reliability
- Developed transportation and utility infrastructure for industry
- Favorable perception of Jordanian product quality

Secondary selling points that may be relevant to specific target markets are also listed below.

- Proximity to Europe, relative to Germany
- Demand of TDM outstrips supply in the Saudi manufacturing sector, relative to Jordan and Saudi Arabia
- Jordan (i.e., Mold Tech) has already attracted Saudi financial investment, relative to Saudi Arabia

The relative importance of the above points depends on the target market for a specific investment promotion event. Therefore, if an outward mission to Germany is planned, JIB officers can highlight Jordan's quality of production, labor skills, cost savings, and infrastructure. For Saudi investors, however, Jordan's appeal when compared to other locations is its proximity and market access to other markets in the region.

### 6.3 Target Markets

Based on the preceding analysis, the authors recommend that JIB's initial focus should be to promote the consolidation of the local TDM industry and to attract DDI. This is to be

followed by efforts to attract financial investors from Saudi Arabia and outsourcing investment or activities from German TDM manufacturers.

Our analysis indicates a great deal of housekeeping must take place before Jordan's TDM industry can expect to attract substantial FDI. This is why consolidation of the local industry and new DDI are more likely to attract investment in an initial stage.

Local investors wishing to establish export-oriented TDM companies in Jordan, in order to take advantage of its skilled labor and central location, could be attracted quickly, especially those already active in the manufacturing sector and wishing to develop its linkages.

In addition, establishing relationships with well-connected Saudi financial investors, who would bring both capital and customers, yet employ local expertise to serve their expanding manufacturing sector in which demand outstrips local supply can offer a good potential for FDI attraction.

Finally, another possible way to attract FDI is to invite German TDM producers to lower their costs by outsourcing their assembly or production to Jordanian firms. Germany has a high concentration of TDM manufacturers, which face extremely high labor costs.

In other words, JIB's first-year promotional strategy should include missions to potential local investors, while the second and third years would involve overseas missions to Saudi Arabia and Germany.

## 6.4 Target Investors

The investors who should be targeted by JIB in the first phase of a plan to promote investment in Jordan's TDM industry are as follows, in descending order.

- Local investors and manufacturers
- Saudi financial investors involved in their country's manufacturing sector
- Large German TDM manufacturers

The targeted size for an average investment should be around \$5 million. This figure is based on an examination of the operations of existing producers that engage in export activity (i.e., Mold Tech and the Nayzak operation). Average employment per plant could be around 70 employees.

A brief profile of projects that would be potential targets for FDI attraction is presented in Table 6.1.

**Table 6.1: Profile of Target Investments**

Project Size (including buildings)	\$5,000,000
Employment	70 workers
Markets	> 60% of exports to regional markets
Typical product categories	Dies of base metal, molding patterns, molds for metal or metal carbides, molds for mineral materials, molds for rubber or plastic manufacture of semi-conductors

## 6.5 Annual Investment Targets

A focused plan to promote investment in Jordan's tooling industry will start by targeting TDM investments of around \$5 million each in the recommended markets.

Following this plan, the authors expect investment in the sector to grow as detailed in Table 6.2.

**Table 6.2: Annual Investment Targets**

	Year 1	Year 2	Year 3
Cumulative number of projects	1	2	4
Size per Project (\$)	5,000,000	5,500,000	5,775,000
Employment per project	70	74	78
Total employment	70	148	312
Total investment (\$)	5,000,000	11,000,000	23,100,000

The following assumptions underlie these projected figures.

- Given that Jordan's TDM industry is nascent in terms of FDI and there is only one investment promotion officer, it is fair to expect no more than one new investment in each of years one and two of the promotion plan, followed by two new investments in year three as the industry grows.
- Project size shall increase by five percent every year over the preceding year.
- Employment per project is expected to increase by ten percent every year.
- The investment promotion officer shall undertake three outward missions per year, one every four months.

## 6.6 Resource Requirements

To achieve the above targets, JIB needs to have the following resources in place.

### Personnel

JIB should appoint one precision-engineering investment promotion officer dedicated to functions directly related to the TDM, as well as a part-time researcher to use the necessary databases and other research tools to identify potential investors.

### Research Tools

A database on the TDM industry that provides information on trends, agreements, and latest developments in the sector, as well as general information on public companies is required. Databases on selected regions that have more specific information on associations and companies operating in that region that include technical and market trend-related articles are also helpful. However, these are usually obtained through monthly subscriptions.

### Financial Resources

JIB needs to allocate a set annual budget for activities and expenses to promote precision engineering. The budget should cover tickets and costs associated with three outward missions per year, subscriptions to databases, investor site visit expenses, and communication costs. Table 6.3 provides estimates of the budget required according to function.

**Table 6.3: Annual Promotion Budget**

Function	Unit Cost/Unit (\$)	Total
Outward Missions		
Tickets	1	1,000
Accommodation and travel expenses per day	7	300
Other (e.g., presentation material, equipment rental, seminar hall, and restaurant expenses)	1	2,000
Subtotal		5,100
Total number of outward missions		3
Total outward mission costs		15,300
Databases		6,000
Magazine and site subscriptions		500
International communication expenses		2,000
Site visit expenses in Jordan (e.g., logistics)		1,500
Total annual expenses		25,300

## 6.7 Knowledge Requirements

Finally, JIB promotion staff should continually upgrade their skills, in order to be able to compete with investment promotion officers from investment promotions agencies around the world, all of which are trying to reach and attract a similar group of investors in each sector. Areas in which the investment promotion officers need to be competent are industry expertise, research and investor identification, targeting, effective communication with investors, presentation, and preparation for and execution of promotion missions. See Annex 6 for a list of relevant information sources that can help investment promotion officers to fulfill these knowledge requirements.

## 6.8 Promotional Approaches

The ultimate goal of promotion is investor site visits. Site visits offer maximum opportunity to persuade the “right” investors of the comparative advantages Jordan has to offer. Identifying the right markets and the profiles of investors likely to be interested in Jordan as discussed above, is the first step in a focused promotional process, known in the industry as targeting. The rest of the steps are as follows.

### Research and Profiling

The investment officer should use industry, market, and region-specific databases, free and for-pay websites, and contacts with relevant industry organizations to generate leads about potential investors.

Leads is a critical term to understand, as the objective at this in initial stage is to start collecting as much information on different investors in selected markets and regions as possible, regardless of how sketchy this information may seem to be at first.

Other sources of information to generate or build on leads obtained from initial research are commercial attachés in target countries, chambers of industry, industry-specific associations, and personal contacts with investors from target countries who are already operating in Jordan.

JIB investment promotion officers handling the precision engineering sector should begin to familiarize themselves with the TDM activities, operations, and market participants, starting first with visits to existing TDM manufacturing companies and workshops in Amman, Zarqa, and Irbid.

JIB promotion officers should also read TDM industry articles and familiarize themselves with TDM activities in each target market. Annex 4 contains a list of various online sources and industry associations that can provide valuable research materials to JIB staff.

In addition, acquiring and going over TDM sector publications should be beneficial to the promotion officers of JIB. Annex 5 contains contact information for leading TDM periodicals.

While trade shows constitute only a minor portion of this strategy, participation in at least one TDM trade show each year is suggested for purposes of learning and networking, as well as promotion. JIB should staff participation in such trade shows with two officers, who can simultaneously entertain inquiries from interested individuals and network with other show participants.

### **Correspondence**

The next step is to contact potential investors by sending introductory letters, introduction through industry associations, and invitations to attend functions hosted by the investment officer in the target country. A combination of these approaches may take place in parallel.

Introductory letters must show credibility, highlight Jordan's advantages, address investors' potential concerns, and be concise – investors have little patience to read general mail and constantly receive mail from similar agencies in other countries.

Whenever possible, it is beneficial to mention the name of person or agency that furnished the investor's name to the investment officer.

A typical introductory letter should include the following elements.

- The name of the source through whom the contact was made and the officer's relationship to that person
- The benefits the contacted company will gain by setting up operations in Jordan. The benefits should include, at least, the main selling points relevant to the recipient's country of operation.
- More effective letters include remedies by moving to Jordan that address problems that are specific to the recipient – an opportunity to overcome market access constraints, high operating costs, low profit margins, and so on. Awareness of such customer-specific constraints comes from research, such as consulting databases and other sources.
- Mention of other companies in the same market who have already invested in Jordan
- Introduction to JIB and its role as a facilitator in the setup process
- An indication of follow-up steps, such as a call from a JIB officer, an invitation to an event planned by JIB, and so on
- An attachment enclosing JIB's sector brochure

By this stage in the process, the investment officer is trying to build a relationship with the investor. Therefore, any reply from the investor in any form must be responded to without delay, in order to build on the interest generated by the introductory letter.

On most occasions, investors do not reply to unsolicited introductory letters, and the officer must make follow-up letters or phone calls in the hopes of prompting a reaction.

Follow-up letters could be about developments in the TDM industry affecting Jordan or the investor, or about events planned in Jordan, the region, or in investors' markets. Suggestions for topics to be used in follow-up communications are as follows.

- Developments on market access to regional countries
- Success stories of selected TDM companies operating in Jordan

- Stories of companies or investments that have located to Jordan
- Actions by the Jordanian government to improve the investment environment
- Events planned by JIB in Jordan or target market
- Developments in the performance of the specific company (if available)

Once a number of investors in a certain market have been identified and contacted, or relationships have been built with associations in that market, the time is ripe to execute promotional missions.

## **Missions**

### **Scoping Missions**

This strategy calls for a scoping mission to each target country during the first year of market penetration. These missions allow JIB promotion officers to familiarize themselves with industry associations and dynamics of the TDM sector in each market.

The first scoping mission for promotion of electronics production is suggested for Saudi Arabia, followed by one to Germany. Each of these trips will require about one month planning and preparation. It is suggested that JIB use these scoping missions to secure assistance from local TDM associations or other organizations such as chambers of commerce and industry.

### **Promotional Missions**

A promotion mission should take place approximately four to six weeks after each scoping mission. In year one, a promotion effort locally in Jordan is suggested. In year two, an outward mission to Saudi Arabia is suggested, followed by one to Germany in year three.

Outward promotion missions will work well in countries with active and centralized TDM industry associations, especially where members are within relatively close proximity to the association location. For this reason, these types of promotion missions are typically easier to organize in European markets than in regional markets. In Saudi Arabia, TDM investment should be promoted with individual TDM manufacturers, as well as with other manufacturers that might be interested.

First-time missions include sector-specific seminars, conducted by the investment officer, possibly with an industry expert for support, followed by introductions to the audience and exchange of business information. This typically takes place over a dinner hosted by the promotion agency.

One-to-one meetings are then planned for the days that follow the seminar in which the promotion officer has the first real chance to meet with investors and convince them of the details of the benefits Jordan has to offer. This is a very critical stage in the process. Therefore, the promotion officer must acquire the necessary persuasion and presentation skills to channel the investor into finding real value in the option to locate in Jordan.

Follow-up missions might be required before any of the investors met on the first trip are convinced to visit Jordan.

### **Site Visits and Aftercare**

When an investor decides to visit Jordan, little must be left to chance. The promotion officer needs to accompany him or her throughout the trip, to make sure all questions and concerns are answered, and a positive impression of Jordan is given. Not every investor who visits will ultimately invest, but this should be the goal of every promotion officer and visit.



The relationship between the investor and the officer continues even during the setup stage of the project, when the officer acts as facilitator to expedite the processing of all requirements on behalf of the investor. In selected industrial estates, a representative of the zone manager performs all registration and permitting functions on behalf of the investor to ensure there are no difficulties in the process.

## ANNEX 1: SCOPE OF WORK

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### **I. Specific Challenges Addressed by this Consultancy**

In June 1998, the AMIR Program developed Jordan's first investor targeting strategy, entitled the "Investor Promotion Strategic Plan," to identify those sectors and industries most appropriate for promotion by the Jordan Investment Board (JIB). This plan recommended that Jordan focus on attracting inward direct investment in six principal sectors: downstream potash and phosphates, textiles and apparel, Dead Sea cosmetics, information technology, tourism, and pharmaceuticals. This selection was based on an evaluation of Jordan's economic structure and existing trade and industrial profile, and involved a comparison of these elements with similar measures in other countries in the Middle East and North Africa with which Jordan might compete to attract foreign direct investment. The "Investor Promotion Strategic Plan" has been the basis for the JIB's promotional effort since its publication.

In early 2003, the AMIR Program worked together with the JIB to update the "Investor Promotion Strategic Plan" for two reasons. First, international best practices generally call for updating investor targeting strategies every three years, suggesting that an update of Jordan's strategy was in fact overdue. Second, the five years since the previous strategy was developed have seen major changes in the global trading environment and in Jordan's position in that environment. Among the most important developments have been Jordan's accession to the World Trade Organization; launch of the U.S.-Jordan-Israel Qualified Industrial Zones program; and signing and implementation of a U.S.-Jordan Free Trade Agreement and an E.U.-Jordan Association Agreement.

This updated investor targeting strategy, entitled "Jordan Investor Targeting Strategy 2003," was finalized and published in July 2003. It takes into account recent trends in FDI into Jordan and other countries in the region. It also examines some of the more important worldwide trends in different industries, particularly with respect to market growth, investment patterns, market saturation and over- or under-capacity. This examination takes place in the context of a cluster-based approach, which seeks to identify complementarities among industries and to recommend investor targeting approaches that can contribute to the development of overlapping industries and sectors in ways that potentially have a much greater economic impact than focusing on sectors *per se*.

The "Jordan Investor Targeting Strategy 2003" recommends targeting a number of areas for investment promotion. With appropriate areas for investment promotion having been recommended by the "Jordan Investor Targeting Strategy 2003," the AMIR Program is currently working with the JIB and other relevant stakeholders to develop detailed, three-year investment promotion strategies for such areas. It has already completed strategies for the garment and pharmaceutical sectors, and it hopes to complete strategies for other priority sectors in the coming months.

### **II. Objective of this Consultancy**

The primary objective of this consultancy is to work together with JIB and other relevant stakeholders to evaluate Jordan's competitive position in the precision engineering sector and develop appropriate three-year inward investment promotion strategies for that sector.

### **III. Specific Tasks of the Consultant**

Under this Scope of Work, the Consultant(s) shall perform, but not be limited to, the tasks specified under the following categories:

#### **A. Background Reading Related to Understanding the Work and Its Context**

Consultant shall read, but is not limited to, relevant sections of the following materials to fully understand the work specified under this consultancy:

- AMIR Program. "Investment Promotion Sector Strategy: Garments" (August 2003)
- AMIR Program. "Jordan Investor Targeting Strategy 2003" (May 2003)
- AMIR Program. "Investor Promotion Strategic Plan" (June 1998)
- AMIR Program. "A Sustainable Institutional Framework for Investment Promotion and Enterprise Development in Jordan" (June 2002)
- AMIR Program. "A Sustainable Trade and Investment Strategy for Jordan" (May 2002)
- Investment Task Force. Relevant sector studies. (January 2002)
- AMIR Program. "The Jordan Pharmaceutical Cluster: Analysis and Recommendations" (July 2002)
- AMIR Program. "JIEC Market Demand Study for Serviced Industrial Estates (April 2002)
- AMIR Program. "The 2002 Investor Roadmap of Jordan" (October 2002)
- AMIR Program. "AMIR 2.0 Technical Proposal"

#### **B. Background Interviews Related to Understanding the Work and Its Context**

The Consultant shall contact personally, by e-mail, or by telephone the following individuals in order to fully understand the work specified under this consultancy:

- Greta Boye, PSPI Team Leader, AMIR Program
- Barry O'Connell, Investment Promotion Advisor, AMIR Program
- Brad Fusco, Investment Promotion Advisor, AMIR Program
- Reem Badran, Director General, Jordan Investment Board
- Relevant promotion officer(s), Jordan Investment Board
- Naseem Rahahla, Director of the Competitiveness Unit, Ministry of Planning
- José Ceron, Investment Promotion Advisor, ATASP
- Representative foreign and domestic investors in target sectors
- Representatives of public and private sector entities relevant to target sectors and their clusters
- Relevant public and private industrial estate and free zone operators
- Jamal Al-Jabiri, Project Management Specialist, USAID

#### **C. Tasks Related to Achieving the Consultancy's Objectives**

The Consultant shall use his education, considerable experience, and additional understanding gleaned from the tasks specified in A. and B. above to achieve the following for each of the five target sectors.

##### **1. Establish Context**

Assess (1) Jordanian sector, (2) Jordanian cluster, (3) leading competitors with Jordan in sector, and (4) global industry and trade in sector.

Assessment of Jordanian sector should include a detailed review of existing investment and trade and an outlook for future investment and trade. It should also include consideration of

relevant market access agreements, factor costs, available technology, and technical capabilities.

Assessment of Jordanian cluster should include a brief overview of the cluster in which the firms that comprise the sector participate, as it relates to the promotion of investment. This overview should be organized according to Porter's "five forces," namely (1) firm strategy and rivalry, (2) demand conditions, (3) supporting firms and institutions, (4) factor or supply conditions, and (5) government.

Assessment of leading competitors with Jordan in sector should include a similar review of existing investment and trade and an outlook for future investment and trade, as well as consideration of relevant market access agreements, factor costs, available technology, and technical capabilities, in leading competitor countries.

Assessment of global industry and trade in sector should include consideration of market and investment trends, the structure of the sector, and what the sector looks for in an investment location.

### **1.1 Collect and review current literature**

Literature should include available sectoral and feasibility studies. Sources should be both Jordanian (e.g., MOP Competitiveness Unit, local private investors) and international (e.g., World Bank, World Trade Organization). Relevant information from the literature should be substantiated and updated as necessary.

### **1.2 Identify and interview players in Jordanian cluster**

Players should include existing investors (local and foreign), as well as appropriate representatives from relevant private entities (e.g., business associations, accounting firms, financial service firms), public entities (e.g., JIB, ASEZA, MOP Competitiveness Unit), and donor programs (e.g., AMIR Program, ATASP, EJADA).

## **2. Identify Jordan's Unique Selling Proposition**

### **2.1 Perform SWOT analysis**

In light of the previous assessment, evaluate the following.

- Jordan's strengths and weaknesses in competing for investment in sector
- Jordan's opportunities and threats in competing for investment in sector

### **2.2 Identify sub-sectors and niches**

Based on the strengths and opportunities identified, determine the specific areas within the sector in which Jordan may have the greatest competitive advantage in the future. This determination should take into consideration issues of global and regional integration of processes, as well as industry clustering.

### **2.3 Identify constraints and suggest remedies**

Based on the weaknesses and threats identified, determine the leading constraints to investment in the sector and suggest what measures Jordan might take to alleviate such constraints.

## **3. Develop Three-year Promotional Strategy**

### **3.1 Assess JIB Capabilities**

Evaluate JIB's existing promotional programs and available resources (e.g., promotional budget, staff capabilities) for targeting and attracting investors, with specific reference to identified sub-sectors. Take this evaluation into consideration when developing strategy.

### **3.2 Create Promotional Strategy**

Produce a specific marketing plan for attracting investment in target sectors over the next three years. This strategy should include the following.

- Annual investment targets (i.e., number and value of projects per year, for the next three years)
- Core messages
- Principal selling points, including list of relevant current investors for reference selling
- Target markets and investors (i.e., those markets and investors that can benefit most from using Jordan as a production and/or distribution base for identified sub-sectors. Target investors should be identified in terms of a general profile based on relevant factors, such as sales, company size, and relocation history.)
- Promotional approaches
- Resource requirements (i.e., promotional budget and staff)
- Relevant learning required by JIB promotional staff to implement promotional strategy (e.g., competitor countries, local sector), as well as the sources of information or other means that should be used to acquire that learning (e.g., leading industry journals, company databases, business association participation)

### **3.3 Create Brochure**

Create two-page draft brochure to be used by JIB in the course of implementing promotional strategy. This brochure should take the perspective of potential investors, delivering the core messages, principal selling points, and other information necessary to generate their interest in locating in Jordan. It should focus only on content, not style or formatting.

### **3.4 Compose Press Release**

Compose draft press release to announce the formulation of this promotional strategy. It should provide background on investment and trade in the food processing and electronics assembly sectors (in Jordan and worldwide), describe the threat to Jordan's recent investment in the sectors due to the changing competitive landscape, offer details of the promotional strategy itself, and set this particular strategy in the larger context of the JIB 2003 Investor Targeting Strategy. This release should focus on content, rather than style.

## **4. Build Technical Capacity for Sustainability**

### **4.1 Provide written record**

Provide an annex that describes in detail the way in which the preceding tasks were accomplished, so that this work may be replicated or updated in the future by a member of Jordan's investment promotion effort. This applies to those tasks whose method is not obvious from the deliverable report.

### **4.2 Involve JIB directly**

Demonstrate to selected member(s) of Jordan's investment promotion effort the way in which the preceding tasks were accomplished, so that they may replicate or update this work in the future. If possible, this should be accomplished by working together with those individuals. Otherwise, this should be accomplished through a presentation or training session.

## **5. Identify Follow-on Tasks**

If appropriate, identify follow-on tasks that require attention from JIB or the AMIR Program. Provide the background and rationale for these tasks.

## ANNEX 2: PERSONS INTERVIEWED

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### **AMIR Program**

Barry O'Connell, Investment Promotion Advisor

Brad Fusco, Investment Promotion Advisor

### **Ministry of Industry and Trade**

Amer Hadidi, Director, Industrial Development Directorate

Gina Faraj, Consultant

### **Jordan Investment Board**

Issa Gammoh, Investment Promotion Officer

### **Investors**

Maher Abdel-Qader, Design Manager, Mold Tech

Mahfouz Kassisieh, Owner, MKD

Ahmad Younes Salem, General Manager, Rum-Aladdin Industries Co.

Omar Abu-Wishah, Owner/General Manager, Petra Engineering Co.

Khaled Al Kurdi, Deputy General Manager, Jordan Steel Company

## ANNEX 3: SECTOR CONSTRAINTS AND REMEDIES

### 1.1 Sector Constraints

Interviews with market participants and meetings with relevant staff at government ministries, in addition to the conclusions reached through the SWOT analysis in Chapter Four, have revealed a set of constraints that affect or may affect the growth of TDM activities in Jordan, as well as the country's ability to attract DDI and FDI into the sector.

The main constraints that were identified are listed in Table A.1, along with their perceived level of impact on the industry. This ranking is based on statements made by interviewees and the relevance of each constraint to potential motives for relocation. Impact levels are divided into three categories: A, B, and C, with A indicating the highest impact on growth of the industry.

**Table A.1: TDM Industry Growth Constraints**

Constraint	Level of Impact
Small and fragmented local market	A
Competition from low-cost producers	A
Expensive expertise	A
Expensive production machinery (High capital requirement)	A
Inadequate forward and backward linkages	A
Inadequate links to customers abroad	A
Lack of cooperation and support programs to develop the sector	B
Inadequate managerial and costing skills	B
High labor costs compared to Syria and China	B
Expensive utility costs	C
High overland transportation costs	C
Tariffs on raw materials	C
Lack of industrial design capabilities	C

Category A factors, which may have the greatest impact on the industry, can be divided into five groups.

- Market size
- Competition from other countries
- Expertise
- Capital requirement
- External linkages with customers abroad, plus internal forward and backward linkages

Factors in Category B, which may have a moderate impact, can be divided into three groups.

- Support programs
- Skills
- Competition from other countries

Category C, which may have the least impact, includes tariffs, operating costs, and design issues.

### 1.2 Proposed Remedies

To offset those constraints identified to have the highest levels of impact on the TDM industry, Jordan could adopt the following strategies and initiatives.

- Establish a TDM manufacturers' association
- Develop a world-class tooling business model
- Develop local marketing and technical consortia
- Encourage the creation of user groups

- Introduce new financing tools
- Offer customized consulting and training products

To offset the initial costs of investment in expensive machinery and expertise, Jordanian companies might start by investing in small, specialized machines, develop experience, and then expand.

Introducing the subcontracting of certain precision machining operations to firms not focused on tooling production could help decrease costs of buying all of the machinery required and substantially increase efficiency. These services, based on specific operations, typically have a learning curve of six months to a year and could include the following.

- Heat-treatment capabilities
- High-speed milling
- Deep-hole drilling
- Mold design services

Financial and other incentives to consolidate the industry might be put in place by government.

Government or relevant donor programs might also spur the formation of an industry-wide association focusing on such areas as marketing and technical cooperation.

JIB might lobby for changes to existing laws and regulations, such as an investment tax credit to enhance the capability of TDM firms to purchase new machinery, and changes in the tax treatment for depreciating machinery to reflect the short life span and high cost of machinery and computer software used in TDM production.

Jordanian manufacturers might endeavor to achieve vertical integration (i.e., to get into the business of the assembly of mold parts, in addition to the production of molds).

Support programs for small workshops that focus on the ability to sell and market a product might be sponsored by government.

The formation of buyer groups for the purchase of raw materials, supplies (e.g., cutting tools and fluids), and machinery may also be investigated. Such buyer groups might include firms in related industries.

Government and the chambers of industry might support local producers in organizing or participating in international fairs and exhibitions.

To minimize operating costs such as utility charges, the minimum wage, and transportation fees, we encourage JIB to lobby the government regarding the risks of not attracting FDI due to increases in operating costs. This can be achieved by comparing costs with competing regional countries and demonstrating that further increases in such costs would tip the balance in favor of regional countries in terms of attractiveness as an investment location.

To offset constraints with a lower level of impact, programs that allow university students and workshops to work together can help improve the design capabilities of these workshops, while linking the universities to business. These can be undertaken by the Council of Higher Education, in cooperation with the Amman, Zarqa, and Irbid Chambers of Industry, with support from JIB to coordinate this effort.

Finally, it is recommended that JIB lobby government to make changes to the customs treatment of raw materials imported for producing TDM by allowing them to enter duty-free, so that locally-produced TDM are not at a price disadvantage to imported ones.



The European success in the development of a robust TDM industry is an instructive example that should be followed by Jordan. Most European TDM manufacturers started small and were family-owned. Only when these firms institutionalized their processes and strove to achieve excellence and quality were they able to grow and export.

## ANNEX 4: RELEVANT TRADE ASSOCIATIONS

Table A.2 presents a list of trade associations and other sources of online information about precision engineering and the production of TDM.

**Table A.2: TDM Trade Associations, Information Portals, and Other Useful Links**

Trade Association or Portal Name	Association and Site Description	Internet URL or Address
American Mold Builders Association	Voluntary gathering of American mold builders. Many useful studies and surveys on TDM sector.	<a href="http://www.moldmakingtechnology.com">http://www.moldmakingtechnology.com</a>
Canadian Association of Mold Makers (Camm)	Gathering of Canadian mold makers. Many useful studies and surveys on TDM sector.	<a href="http://www.camm.ca">http://www.camm.ca</a>
Canadian Tooling and Machining Association (CTMA)	Association of Canadian machining and tooling companies.	<a href="http://www.ctma.com">http://www.ctma.com</a>
Japanese Society for the Promotion of the Machine Industry (JSPMI)	Japan-based organization for promotion of TDM manufactures. Useful industry studies	<a href="http://www.eri.jspmi.or.jp/index/index.htm">http://www.eri.jspmi.or.jp/index/index.htm</a>
China Die & Mould Industry Association	Represents the national TDM industry. It has 1500 members and 50 sub-associations in all branches	<a href="http://www.cmttba.org.cn">http://www.cmttba.org.cn</a>
German Machinery and Plant Manufacturers Association (VDMA)	Association of German machining and tooling companies	<a href="http://www.vdma.de">http://www.vdma.de</a>
National Association for the Industry of Molds (Cefamol)	Portuguese national mold-makers association	<a href="http://www.cefamol.pt">http://www.cefamol.pt</a>
European Society for Precision Engineering and Nanotechnology	EUSPEN is the 'European society for precision engineering and nanotechnology' established to provide awareness and opportunities for industries, universities and research institutes to meet, network and mutually benefit from the promotion of ultra precision technologies.	<a href="http://www.euspen.com/">http://www.euspen.com/</a>
National Institute of Standards and Technology (Manufacturing Engineering Laboratory -- Precision Engineering)	Precision Engineering Division (PED) at NIST, providing the foundation of dimensional measurement that meets the needs of the industrial and scientific communities. This site provides industry news, Products and services, Publications, Collaboration opportunities .etc	<a href="http://www.mel.nist.gov/div821/index.htm">http://www.mel.nist.gov/div821/index.htm</a>
American Society for Precision Engineering	Voluntary-based US society. Provides awareness and opportunities for industries, universities and research institutes to meet, network and mutually benefit from the promotion of ultra precision technologies	<a href="http://www.aspe.net">http://www.aspe.net</a>
The Japan Society for Precision Engineering	Voluntary-based Japanese society. Provides awareness and opportunities for industries, universities and research institutes to meet, network and mutually benefit from the promotion of ultra precision technologies	<a href="http://www.jspe.jp">http://www.jspe.jp</a>
Technology data bank -- ISRAEL METAL & MACHINERY INDUSTRY	A list of companies associated with metal and machinery industry in Israel.	<a href="http://punjabgovt.nic.in/Industry/ind_details2.htm">http://punjabgovt.nic.in/Industry/ind_details2.htm</a>
TR – Plastics	Online databases for Plastic companies and a source of Exhibitions and Events related to the industry	<a href="http://www.trplastics.com/plastics/home.nsf/">http://www.trplastics.com/plastics/home.nsf/</a>
1Up –Info	A portal with reference information containing database of articles and reference materials, as well as country guides.	<a href="http://www.1upinfo.com/country-guide-study/germany/germany105.html">http://www.1upinfo.com/country-guide-study/germany/germany105.html</a>
Appliance Magazine.com	US based publication/web-site	<a href="http://www.appliancemagazine.com">http://www.appliancemagazine.com</a>

## ANNEX 5: RELEVANT PUBLICATIONS

Table A.3 provides a list of periodical publications that specialize in news related to precision engineering and the global production of TDM.

**Table A.3: Precision Engineering, TDM, and Related Trade Publications**

Publication Name	Description	Contact Information
Appliance Magazine—European Edition	Appliance industry trade publication covering the European market. Published in Europe (including Turkey) in January, May, and November in English, with German, Italian, and French summaries. Circulation: 8,000	Appliance Dana Chase Publications 1110 Jorie Boulevard, CS 9019 Oak Brook, Illinois 60522-9019 USA Tel: 1-630-990-3484 Fax: 1-630-990-0078 E-Mail: tom@appliance.com Contact Person: Mr. Tom Borbely, Inside Sales Representative
Middle East Economic Digest	Reporting on economies and major business opportunities in the Middle East including banking, construction, transport, tourism, industry, and IT. Published weekly, with circulation primarily in the Middle East and Europe. Circulation: 11,278	MEED Regional Office Office 109, West Building Dubai Airport Free Zone P.O. Box 25960 Dubai, UAE Tel: 971-4-299-5300 Fax: 971-4-299-4200 E-Mail: Richard@meed-dubai.com Contact Person: Mr. Richard Baker, General Manager, Dubai Reg. Office
Gulf Business	Influential Middle East business publication with primary focus on industry and business projects in Gulf states. Published in English, with circulation primarily in Gulf countries. Readership: 19,500	Gulf Business P.O. Box 2331 Dubai, UAE Tel: 971-4-282-4060 Fax: 971-4-282-4436 E-Mail: christopher@motivate.co.ae Contact Person: Mr. Christopher Stevenson, Advertisement Manager
Plastics News	Covers news in the plastics industry including new technologies, trends and outlook. Profiles important companies in the industry. Published monthly in English.	www.plasticsnews.com
Injection Molding Magazine	Covers technologies affecting the injection molding industry. Provides views on industry issues, solutions, and opportunities. Published in English.	www.imment.com

## ANNEX 6: RELEVANT DATABASES

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Following is a list of specialized for-pay databases that may be useful to JIB investment officers as they gather market- and company-specific information on precision engineering and the manufacture of TDM.

The first two listed here are based on annual subscriptions, while the last one is billed on monthly basis. It is recommended that the promotion officer request a free trial period to try out the modules in each the first two databases to determine which one is more useful to JIB's promotional needs.

### **Business Browser**

"Business Browser" from OneSource Information Services, Inc. is a web-based information tool that integrates comprehensive and up-to-date business and financial information on over one million public and private companies from more than 25 information providers drawing on over 2,500 sources of content. These sources include both textual information, such as news, trade press, executive biographies and analyst reports, and numeric information such as company financial results, stock quotes and industry statistics. This database is available in a global edition, as well as specialized versions for the U.S. and Canada, the United Kingdom, Europe and Asia Pacific, and with varying degrees of company and executive coverage in each package.

The annual subscription fee for this database is \$20,000 for the European edition, which includes ample information on European, Middle Eastern and Asian companies.

More details and sample screens from this service can be found at the following web address.

[http://www.onesource.com/products/content\\_107.asp](http://www.onesource.com/products/content_107.asp)

### **InSite**

"InSite" offers the latest news and in-depth analyses reported in the trade, business and popular press: competitive intelligence that helps make key business decisions. There are several modules within this family of products, including Business InSite, Market InSite, Consumer InSite and Company InSite, each offering a different focus on a breadth of indicators and analyses.

The annual subscription fee for this database is \$5,200.

Further details on this service can be found at the following web address.

<http://www.iac-insite.com/about.htm>

### **World Market Watch, Inc.**

"World Market Watch, Inc." is a software tool designed to simplify business intelligence gathering and houses information on over one million companies, with up to 33 different types of business information on each company. It contains access to industry-specific products as well as country-specific reports.

Subscription rates are currently at US\$29.95 per thirty days.